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Notes of the Month

TASKS CONFRONTING EAST AND WEST

SPEAKING at a recent press conference in Manchester Senator Dr. Kurt Dieterich (Federal Republic of Germany), newly elected president of the International Federation of Cotton and Allied Textile Industries, said the purpose of his visit was to discuss current affairs of the federation and to meet representatives of member associations in the U.K. to discuss some of the problems with which the cotton textile industries were faced at present. Dr. Deiterich said he considered the redundancy and re-equipment scheme, which the Lancashire cotton industry was carrying out as one of the most courageous and radical operations which any industry in any part of the world had ever undergone. Cotton industrialists on the continent and overseas followed with admiration the speed and determination with which the programme was being carried out. They hoped and were confident that the Lancashire cotton industry would re-emerge from this operation as a compact, efficient and vigorous industry. One could not help feeling, he continued, that the Lancashire cotton industry presented something of a test case, not only for the cotton textile industries in the older industrial countries but for all industries in general. The industrialisation of formerly under-developed areas had advanced very far. Many of those countries had now reached the so-called "take-off stage" in their economic development. New industries were being built up, claiming their share in world trade. The old-established industries in countries with high standards of living and equally high costs of production found themselves faced with a completely new situation. They were compelled to make bold and sometimes painful adjustments in order to meet changed conditions.

It would be one of the most important tasks of the future to permit and promote the advance of the developing countries, whilst at the same time safeguarding and maintaining the prosperity of the old-established industries in the countries with high standards of living. "To put it bluntly: How can the textile industries in the East and in the West live and prosper together, without cutting each other's throats?" Members of the Federation had given much thought to this problem and had come to the conclusion that a solution can only be found jointly. "Since most of the existing difficulties centre around such ambiguous concepts as abnormal competition, dumping, sub-standard labour conditions, abnormal prices, fair shares in the market, etc., we have decided that these aspects of textile trade competition should be closely examined at our next annual meeting, which, incidentally, will be held in Japan," said Dr. Dieterich. The cotton textile industries of Europe were meanwhile faced with another formidable problem within their own area—the "Six" and the "Seven," the European Economic Community and the European Free Trade Association. "We consider it of the utmost importance and urgency that some form of an association between the 'Six' and the 'Seven' should be found. We also believe that there should be a harmonisation of commercial policies towards non-European countries between the E.E.C. and the E.F.T.A. Within our own sphere, and through the medium of the Committee for European Affairs of the Federation, we are at present working out proposals for such an all-European integration on an industrial basis."

SCOTTISH LINEN TRADE BUSY

THE improvement in the Scottish flax and linen trade had continued this year and all sections were now extremely busy, said Mr. A. D. N. Smith (president, Flaxspinners' and Manufacturers' Association of Great Britain), at the recent annual meeting in Dundee. He added that the difficulty facing the industry now was to find sufficient workers to maintain production at full strength. The situation had not been helped by a recent reduction in working hours, from 45 to 43, particularly as delivery commitments to customers were already running into next year. This reduction in hours, without loss of earnings, together with a wage increase earlier in the year, would result in higher prices, which could only be offset by improved efficiency. The future as a whole was more reassuring than when he took office two years ago when work was scarce and many establishments on short time. Tariff questions had exercised the Association to a great degree during the year.

Mr. Ian Reekie (chairman, Domestic Linen Weavers Committee) also referred to the improvement in trade which had affected both the heavy canvas side of the industry and the domestic linen end. The one difficulty was labour shortage, but there had been a substantial increase in the number of trainees. Firms were co-operating in the development of a new range of printed towels with a Scottish motif, but this had been slowed down because of the large volume of work on hand and the need to concentrate on immediate production.

PROGRESS IN JUTE RESEARCH

SPEAKING at the recent annual meeting of the British Jute Trade Research Association in Dundee, Dr. H. P. Stout, Director of Research, said: "In reviewing the work carried out during the past year, one is struck by the great strides which have been made recently in our knowledge and understanding of jute processing. The fundamental studies of the physics of fibres and yarns which have gone on steadily for many years are bearing fruit. We can now measure and observe in some detail the important characteristics, both of fibre and of the machinery which handles it, which determine the quality of the yarn we spin today. With this increased knowledge we can see more clearly the

directions in which new ideas, and new ways of doing things, must be developed if we are to achieve our aim of utilising jute fibre in the most effective and economical way. Progress in one section is not enough, however, and we must strive to increase our knowledge in all fields, so that advances anywhere may be exploited to the full. More of our resources are now being put into studies of the fundamentals of weaving."

Dr. Stout said that much thought had been given to the problem of passing on the findings of research to jute firms. A series of discussion meetings held during the year had proved exceedingly popular. He felt that conferences of this kind could become a regular feature to provide a channel of communication, and added: "With your encouragement and continuing interest in the work of the research station, we hope to assist the jute industry to grasp some of the possibilities now appearing."

TEXTILE TARIFF PLANS

THE Cotton Board and the British Man-made Fibres Federation announce that plans for establishing a Joint Cotton and Man-made Fibres Tariff Section have now reached an advanced stage. The two organisations have co-operated closely on tariff matters for many years and the linking of their activities in this field is regarded as a logical development. The Tariff Section will be under the direction of Mr. J. H. P. Hadden, the head of the Federation's Tariff Department since 1954, and recently appointed Director of the Overseas Trade Department of the Cotton Board. The services of Mr. Hadden and the Section will be at the disposal of both the Board and the Federation and much of the work will be of value to both industries. Occasions will arise, however, where the interests of the fibres diverge or where only one industry is affected by a Tariff Board Enquiry, etc., and Mr. Hadden and the Section will then be responsible to the Cotton Board or the Federation as the case may be, for the provision of background material, preparation of representations, etc.

A very essential part of the work of any Tariff Department is the day-to-day routine perusal of changes being made or proposed in customs tariffs throughout the world and the collation of this information so that it may readily be referred to as occasion demands. The Board and the Federation have decided to pool their existing tariff material and to create within the new Section a joint library with the object of eliminating a duplication of effort. Primarily the library will exist to provide all background, historical and statistical information required in the preparation of representations on Tariff Board Enquiries, tariff applications, etc., and to meet all requests from the cotton and man-made fibres industries for information on overseas customs tariffs, trade agreements and arrangements, import/export regulations, quotas, etc.

WORLD COTTON CROPS

STATISTICS recently released by the U.S. Dept. of Agriculture show the world cotton crop to be a record high for the third successive year. Total world production in 1960-61 is expected to be about 47·1 million bales (500 lbs. gross weight). This crop exceeds last season's record by 0·7 million bales, and production is expected to be in close balance with world consumption. The U.S. 1960 crop of 14,553,000 bales is only 5,000 bales less than the 1959 crop. Acreage for harvest is estimated at 15·5 million acres, up 3% from 1959, and yield is estimated at 450 lbs./acre compared with 462 lbs. in 1959 and the 1958 record high of 466 lbs.

The 1960 crop in Mexico, estimated at 1·9 million bales, is slightly less than an earlier estimate; unfavourable weather in the Matamoros and Sonara regions affected the crops. At the moment it appears that Brazil's 1960-61 production may exceed last year's 1·7 million bales; harvest of the north Brazil crop is estimated by trade sources to be about 50,000 bales larger than in 1959-60. The area planted to cotton in Argentina in 1960 is expected to about equal last year's 1·5 million acres; harvested area and yield are expected to increase unless difficulties such as excessive rains are encountered. The 1960-61 production in Peru may be slightly larger than last season, with larger crops of Tanguis and Pima-Karnak expected to offset a decline in Aspero, Acala and Cerra varieties. Venezuela's production is expected to increase over the 42,000 bales in 1959-60 but production is declining in Ecuador.

For the second year, Spain is likely to be the largest cotton producing country in Europe with a crop expected to total about 340,000 bales compared with 298,000 in 1959. Growing conditions in Turkey's Aegean area have been generally good. Prospects are also good in the Antalya area but the Adana crop is below earlier estimates. The total crop is expected to equal last year's 850,000 bales. Israel's production of about 48,000 bales is double what it was two years ago. The crop in Pakistan is likely to be about 1·4 million bales, an increase of some 4% over last year. The goal under the second 5-year plan of about 1·9 million bales by 1964-65 is being sought by increasing acreage, improvements in irrigation, drainage and seed and more plant protection. India experienced an acute shortage of cotton after a small crop of only 3·3 million bales last year but the trade currently estimates production will return to a more normal level of around 4·0 million bales in 1960-61. India's cotton production goal under the third 5-year plan is about 5·9 million bales by 1965-66, an increase of about 33⅓% over present levels.

Egypt's first official estimate of the 1960-61 crop is 2,262,000 bales which is 8% higher than last season's 2,100,000 bales. Most of the increase is in the medium/long staple Giza varieties, while production of Ashmouni is down by 7%. Acreage is up 6% over 1959-60 with Dandara acreage expanded in Upper Egypt while Ashmouni was reduced, and the new varieties Giza 45, Giza 47 and Bahtim 185 showed large percentage gains. Production in Sudan is expected to be around 10% higher in 1960-61 than last season's crop of 560,000 bales. Yields are also expected to improve over last years 285 lbs./acre. The government is encouraging larger production of upland types. Drought in Uganda has reduced acreage to around 1·5 million acres in 1960-61. Tanganyika had prospects of a bumper crop but bollworm and lygus damage have reduced estimates to a total of about 170,000 bales, only slightly more than in 1959-60. In the Congo, estimates of acreage and production have been reduced substantially because of political turmoil. In the countries formerly known as French Equatorial Africa, production is expected to increase in 1960-61 above the low level of last season. Production in the Portuguese Overseas Province of Angola is increasing and will total about 39,000 bales.

Extra long staple production in the free world this season is estimated at 1·9 million bales, up 3% from 1959-60. Most of the increase is expected to be in Sudan and Peru. In the next few years, the area devoted to Pima-Karmak in Peru is expected to expand from about 150,000 acres at present to some 200,000 as the Quiroz irrigation project comes into production.

Balancing Production with Final Offtake

One of the sessions at the recent conference at Harrogate was devoted to the above theme and four authorities from different sections of the industry contributed the following papers

The Spinning Section

By F. NAPPER†

THE urgent need for a keen realisation of the importance of avoiding fluctuation in demand at the early stages of textile production arises mainly from the fact that the spinning and weaving sections of the industry are attempting, by ingenuity and adaptation, to fulfil two fundamental roles at one and the same time. The first and traditional role is that of mass production; the second, of more recent acquisition, the production of specialities. If these apparently conflicting functions are to be adequately performed, it is most important that the problems involved be fully understood and assistance given by every other section.

Considerable changes have occurred in the management and administration of mill units since the pre-war era and when yarn is not being absorbed by customers, the limit of stocking is reached much sooner than in the old days. Ring tubes are expensive, and with the modern ring spindle the cost of stocking yarn in containers becomes alarmingly expensive. The alternative of running beams to stock has never in my experience been satisfactory, though a certain amount of standard counts wound on cone or cheese is feasible and relatively inexpensive.

One extremely important point is the spinning of large weights of cotton yarn without any cover at all. In these days of Governmental interference in the pricing of raw cotton in the country of origin, and the export incentives given by some countries, great losses can be incurred by the time the yarn is sold. I know some people will say that large profits can also be made if the market rises. This is true, but no spinner is in business to speculate. He wants to make a profit by normal trading and keeping his expensive machinery running at full capacity.

A broad outline of the changes which have taken place since pre-war is illustrated by the following facts:—

Approximate Raw Cotton Statistics
(Million bales)

	Pre-War	Now	
Consumption ..	**2·70**	**1·30**	**(about half of pre-war)**
Stocks	**1·2**	**·20**	**(about one-sixth of pre-war)**
Price — Mid.	**(lowest 1937) 4·20d.**	**approx. 21·40d.**	**(about five times greater)**

The general impact of these figures on the spinning section needs no further elaboration.

In spinning a steady flow is essential to efficient production; but, unlike the car industry which broadly predetermines public demand and supplies a small range of identical products, the spinning industry now serves a complex variety of demand in quality, count, twist and form of make-up to satisfy the mutifarious styles and finishes now applied to the woven cloth. In addition, complications arise from the demand for blends of cotton with other fibres and the increasing demand for synthetic yarns.

Certainly the most important factor of all is the human one. Our operatives have seen many ups and downs in activity, and I do believe most sincerely that in this steamlined industry of ours we must find a solution to enable constant full-time running to operate. I know all of us are concerned about the labour position. Recent figures on recruitment of labour show we are barely keeping pace with wastage, and any future short-time running will see once again a strong movement away from the mills. I cannot stress too strongly the importance of this factor. One has only to go through factories to see that the average age of our operatives is too high. Much effort must be made to attract more young people.

Buyers of cloth and yarn must understand that it is in their interests as well as ours that machinery must run full out. Any more limiting of production will be fatal. No longer have we a vast reservoir of idle machinery to bring into operation when trade is buoyant, and there is no doubt that if we ever have to diminish our productive capacity again, foreign cloth and yarn would not be available at cheap prices indefinitely.

World population, now nearly three thousand million, is increasing at the rate of forty-eight million people per year. This means, in terms of present average consumption *per capita*, no less than 700,000 bales increase per year over present production. One has to admit this may not mean a lot of increase for our country, but the trend is there and cannot be ignored.

Conclusions

Spinners, having accepted the responsibilities of providing the 'buffer stocks' of raw cotton cannot now be expected to continue to hold yarn stocks adequate to supply the needs of a continuously changing pattern of demand.

The problem facing us today is one which is created within the industry itself and consequently it remains for the industry to find the solution. On

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the one hand we have the producing sections with a relatively static potential output. This must be so because the capital cost of machinery precludes either hasty installation or premature disposal. On the other hand, we have a relatively static consumption of our final product. We must, therefore, look within for our solution.

It is evident that there is a co-relationship between the comprehensive cloth delivery period and the level of trade activity. In times of active trading, the total time to spin yarn, weave cloth, apply the required finish and make it available to the consumer is considerably longer than in periods of recession. This is, of course, due to the uneven placing of orders at each stage of production. During periods of increasing demand for the industry's immediate products, the rate of current orders exceeds the rate of current production—order books and delivery periods lengthen at each stage and there is a mad scramble to find the producer with the shortest order book. It is a fact that in such circumstances the delivery factor takes precedence over the price factor. In periods of recession, the reverse operates; the rate of current demand for intermediate products is less than the rate of current production, order books dwindle and delivery periods are shortened. If the recession is prolonged, price weakness creeps into the producing sections in an attempt to stimulate offtake with the consequential encouragement of attempted cancellation of orders already in hand with one producer in order to re-book at lower prices with another.

To my mind the main cause is the speculative element which permeates the industry—fostered by its horizontal structure. Speculative anticipation is by no means a bad thing in itself but only in so far as it creates no unnecessary ill-effects on other parties. I have always felt that in the final price paid by the consumer for the industry's products, there is sufficient for a fair return for all sections, and over a long period this is perfectly true. The price reduction granted by a producer during a period of recession is offset by the scarcity price operative when demand is active. How often has a large buyer induced depressed conditions artificially by "holding off" because of speculative anticipation of a fall in cotton prices? How often have other buyers discarded their existing suppliers to obtain the temporary advantage of cheaper supplies from abroad knowing full well that the normal price will still be paid by the ultimate consumer?

We must all realise that every trader in every section has a responsibility to the industry as a whole—we must widen the scope of our understanding of the problems of others if we are ever to achieve more stable conditions in which to trade. Changes in the pattern of demand are inevitable if we are to make progress; the earliest possible notice of intended changes in cloth construction, quality, or design must be communicated to the producing sections much earlier than has been the custom so that arrangements can be put in hand to accommodate the amended requirements.

The more one thinks about the problem we are considering today, the more certain one feels that given good heart and good co-operation between buyer, merchant, finisher, weaver and spinner, some solution should be possible. It is surely nonsense that a variation of a mere 5% in consumer usage can result in producers working machinery for long periods at a low and uneconomic level of activity.

The instability is increased by reason of the fact that the industry's main raw material, cotton, is subject to fluctuations of a commodity market. The effect of commodity market variations has been intensified by the emergence over the last few years of large groups of textile buyers who study the market trends and are aware of the difference that lower or higher raw cotton costs can make to their profit and loss account.

An investigation should be made into new outlets and the increasing usage of present styles of production.

Cotton Board Conference

The Weaving Section

By A. DRAPER, F.T.I.†

WHILST the off-take of the industry's products by the final consumer remains remarkably stable from year to year, the industry itself is subject to very great variations in the volume of orders it receives. The purpose of the session is to concentrate attention and thought upon possibilities of solution of this important problem.

Weaver's Point of View

I propose to deal with this under three headings:—

(1) Present position of the weaving section of the industry since reorganisation.
(2) Importance of a steady flow of orders.
(3) Suggestions for improving the position.

In dealing with the first part I think it is useful to examine what has taken place since reorganisation. In May, 1959 the number of looms in the cotton and man-made fibre weaving industry, in running mills, in Gt. Britain (excluding N. Ireland) was as follows:—

Automatic	**47,401**
(Includes looms which were originally constructed with a fully automatic weft replenishing system	
Non-Automatic	**198,645**
Total ..	**246,046**

In July, 1960 we had:—

Automatics	**47,571**
Non-Automatics	**119,760**
Total ..	**167,331**

The figures include looms on other natural fibres (wool, linen and silk) in mills which also weave cotton and/or man-made fibre cloth.

These figures show there has been a slight increase in automatic looms while the number of non-automatics has declined by 78,885 or about 40%. In spite of this drastic reduction in the number of looms the output of fabric in the six months ending June 30, 1960, was higher than last year. Although it should be remembered that the production in the first few months of 1959 was unusually poor when buyers were awaiting the decision of the yarn price agreement before placing business, nevertheless the increase in average output per loom has been substantial and this has been achieved by the industry running longer hours at a higher efficiency.

More looms are now running two and three shifts and in some cases a

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"housewives' shift," operating from 6 to 10 p.m., has been established. The average hours per running loom have increased from 52 to 60 a week. There are actually many combinations of these arrangements which have contributed to this increased output. We now have a more highly geared industry and particularly so in the automatic section, where some plants are working three shifts. The average age of operatives is still fairly high, so that it is imperative that we have a steady flow of orders to hold the present labour force and attract new recruits.

If we look at the home market consumption of textiles it still appears that there is plenty of scope for an expansion of sales if we produce the right kind of goods. The multiple retail organisations are able to give orders with longer runs on standard qualities and yet give plenty of imaginative variety in the final product. In many cases it has been possible to improve quality and performance standards and keep the selling prices attractive.

In spite of the fact that the industry in Lancashire since reorganisation is more highly geared and efficient, recruitment has been severely retarded. We shall not obtain our share of juvenile entrants so urgently needed if we do not have a steady flow of orders, so that we can progressively modernise and keep our wages and conditions at least as good as or better than other industries. Good quality and low costs depend upon a good production flow.

If we are to get the best out of our scientific and technical development we need a co-ordinated production plan in which the spinner, weaver, finisher, wholesaler and retailer all play their part. There will not be the necessary capital investment in continuing modernisation if we have interruptions in the steady flow of orders to the looms, as has happened frequently in the past. It is, therefore, highly desirable that we do everything possible to improve the flow.

Improving Flow of Orders

The first essential for improving the flow of orders is the creation of a buoyant demand. If that is present the climate is then favourable for all sections to co-operate and achieve a steady flow. We need more wholesalers with connections with large numbers of retailers who can help create new fabrics and plan large scale production with the co-operation of spinners, weavers and finishers. In slack periods such groups could arrange to stock standard lines and remove the need for large scale importations of cloth at a later date. This may require funds to cover variations in prices of raw materials but if such a fund were built up in good times it would provide a useful insurance. To carry this out really effectively the industry would need statistical information from the Cotton Board on the lines of that supplied by the Man-made Fibres Federation.

In addition the Cotton Board fabric promotion schemes should be intensified and the emphasis directed to those sections which could be expanded more profitably. Greater attention should be given to the requirements and spending power of the 15 - 29 age group, the group which has the highest spending potential and which itself is increasing by around 10% during the next seven years, by reason of the post-war bulge. Much more can be done to expand sales at home and abroad in men's clothing for casual wear, household textiles, furnishings, ducks and canvas, etc. We should continue and intensify our co-operation with the National Cotton Council of America in promoting new uses for textiles.

Comparing the consumption in units per head of cotton textiles in the U.S.A. with that in the U.K., we find that in bedspreads, quilts, sheets, cotton blankets, tickings, towels, blouses, dresses and foundation garments it is over 50% higher in this country, whilst the consumption of the groups comprising curtains, upholstery and drapery (excluding lace) and men's and boys' shirts, pyjamas and underwear, is more than double ours.

We should ask our Research Associations to concentrate more on new uses and product improvement during the next few years. Finally, I feel the Government should give some protective encouragement to the industry by an early assurance that they will control imports of yarns and fabrics at a reasonable level.

Cotton Board Conference

The Finishing Section

By W. CROSSLEY†

MY primary role is to discuss the cause and effect of the hitherto uncharted problem of trade fluctuations in the finishing section of the industry where they occur to an alarming extent, and to consider whether it is possible to adopt remedial measures.

I am one of those who believe there are virtues and disadvantages in both horizontal and vertical integration, depending sometimes on the type and volume of the type of work processed and the variety required; but whether this is so or not, we must be realistic and accept the fact that any change from horizontal to vertical trading, if it is desirable, can only be gradual and that our problem in the immediate future is to get the best out of this two-dimensional system of trading. As the horizontal system predominates, however, I shall deal mainly with the defects of that system, for it is undoubtedly these defects which cause most of the finishers' production troubles.

The trade in general, and the finishers in particular, live in a paradoxical world which confuses the inmates let alone the outsider. This, of course, is due to the variety of end products we make in which, shall we say, the policy adopted for towel manufacture and marketing, is quite useless for shirtings, and so on. The fact that no master plan is possible is no reason why the fastidious perfectionists—I refer to those in the industry who know that the masterly way to obstruct is to advocate perfection—should have so much influence in our deliberations.

We are aware that mass production and immense variety are incompatible bed-fellows; yet in some measure both are essential, and our job is to find the right balance to suit the particular circumstances. The negative approach merely creates needless variety, thus increasing costs of production. Is it really necessary to have over twenty shades of corset pink or a dozen shades of white for shirts?

Standardisation and diversification are another two unavoidable incompatibles. But need we devote effort in trying to give cotton some of the characteristics of the synthetics and, at the same time, reverse the

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process by trying to give the synthetics some of cotton's characteristics; or again give lustre to dull fibres and de-lustre bright ones?

In an age of surplus capacity and shrinking exports, I submit we often devote our talents and lay waste our powers in the wrong direction. The crying need of the industry (apart from the Asian imports problem) is increased consumption *per capita*. If we must make fabrics more durable and if we are going to increase their life by cleaner air, better laundering and improved dry cleaning, it must be counteracted by increasing society's desire for textiles, coupled with the cultivation of rapid change. This requires a far deeper study of human behaviour towards textiles than has ever so far been given. It is not just a question of market research, it involves a retreat by the isolationists who maintain that everything done outside their own four walls is a waste of time.

Increased consumption also involves cloth being in the right place at the right time and this is where we come up against the defects of the horizontal system. It is not so much the actual physical separation of the producing and merchanting functions in itself that is dangerous, for they both require specialisation of a high order, but rather that neither has any financial responsibilities in the other's sector. Their approach to matters relating to price levels in particular regulating the flow of work, stock piling, etc., are diametrically opposite. It is this fact that led to the formation of Price Federations prior to the Restrictive Practices Act and gave to our prices a rigidity which certainly did not help our export trade. The circumstances are, I think, peculiar to this industry and arise because there are 390 finishing units (hardly two alike) prowling round Manchester and the other textile centres for orders from approximately 1,000 merchants, of which about 400 do 85% of the trade. If every finishing unit has only 10 large and 20 small customers, the amount of overlapping must be fantastic and the merchants would be less than human if they did not dominate the situation. Price regulation of a rigid character was therefore a defensive measure forced on the finisher and now that it has gone consideration has to be given, for the same reason, with or without Government aid, to reducing capacity to intake. This is an extremely difficult undertaking in view of the variety of plant involved.

All this arises, I submit, because neither section has a stake in the other's activities. A solution in part might be to give some elasticity to our price schedules, giving more consideration to bulk runs and encouraging stock piling.

At present inadequate account is taken of the size of orders. The conference may be surprised to learn that, judging from a cross section of the dyeing trade, the average order only seems to amount to 30 pieces. On many finishing machines this is less than an hour's work and the time taken to prepare a machine for this run is often greater than the time spent in running it. Orders of a like kind have therefore to be grouped together and for some this involves delay. Moreover as cloths from different manufacturers frequently have their own particular idiosyncracies, inconsistent results are bound to occur.

Certain surcharges are made now for very short runs and concessions given for long runs, but the vast area in between is processed at a fixed price. A more elaborate graduated scale should be used, coupled with a basic charge per order irrespective of its size. The overall effect of this would be to reduce costs of production and improve efficiency. It would not solve the problem of fluctuations, it might even aggravate it, so that as a policy it should not stand alone.

Stock Building

The encouragement of stock building probably provides the missing link, for the haphazard nature of our intake is deteriorating year by year. When the industry was much larger than it is today, when the variety and world-wide destination of our exports tended to level out local slumps and seasonal changes, the old methods worked well enough and caused no acute discomfort. On present volume, however, I believe we have reached, if not gone beyond, the peril point below which the horizontal system could break down altogether. We have reached the stage when the intake is so volatile—not year by year, but month by months and even day by day, that production planning and economic production is quite out of the question. The average finisher has hardly any idea what the size of this order book will be tomorrow. The arrival of a shipment of grey cloth from the Far East can put a works on overtime for a week and this can be followed by an uneasy lull until the next boat arrives.

When a survey of the finishing industry was carried out on behalf of the Cotton Board in 1954, it discovered that the periodic inflow of orders received by many individual finishers varied as much as 100% in any one year. Cases today exist when the ratio is 3 to 1. In this age of full employment when labour must be kept, the resultant wastage of labour resources by under employment even for only one-quarter of the year and the overtime rates (some at double time) paid during the peak periods for say another three months, can amount to over £2 million on our wage bill of about £15 million a year.

The obvious remedy is more stock piling, not of raw cotton or even of more yarn and grey cloth—the reserves are probably large enough already—but of cloth in the finished or partially finished state, which can be snapped up on demand by the consumer before his urge to buy wears off. We all know, and the Cotton Board have confirmed in their surveys of the Scandinavian, German and Canadian markets, that significant sales are lost every year because of our inability to supply replacement orders in reasonable time.

There may then be something in the view that cotton stocks are in the wrong place—too far removed from the consumer, or at least they are wrongly distributed between grower, spinner, weaver, finisher and merchant.

But can we expect the merchant alone to carry the burden of moving stocks along the pipe-line to a more forward position? If, as I suspect, it is financially impracticable, we must give him some financial inducement to take the steps which will help sales, lower costs, and help us at the same time.

Stock Incentive Discount

With due deference and caution I therefore submit for the trade's consideration the introduction of a "Stock Incentive Discount." For the purpose of discussion I suggest that this be at the rate of 5% per month, after allowing four weeks for finishing, to be effective for a period of up to five or six months. A condition would be that the cloth was stored on the finisher's premises.

This proposal might at first sight lead my friends in the finishing section to recoil with horror at the thought of adding complications to an already confused set of price lists. Even admitting that finishing is not an industry at all, but really a way of life—and a peculiar one at that—I would share their horror if I thought that the meagre reward for our services was thereby to be further curtailed; but from a cursory calculation I estimate

that on average, if half the trade was brought forward three months—a big assumption—the discounts would not exceed the saving in labour costs. Additionally there would be substantial savings arising from continuity with its opportunities of planned production, better quality control possibilities, and increased reliability of delivery dates. The enhanced feeling of uncertainty within the section regarding one's competitors' price range could be a cause of anxiety I admit, but I think some recording system could be employed which would allay these fears.

It is recognised, too, that in fixing the actual discount allowed (the 5% per month is only a suggestion) due regard will have to be paid towards the cost of borrowing the necessary finance. The discount must be high enough to act as an incentive and low enough to prevent the switching of the peak from one period to another. More than one formula for different subsections might be necessary.

Finally, I would add that the proposal does not envisage the public disclosure of stocks which always has such a serious depressing effect on market values. The arrangement is permissive and like present trading arrangements would be known only to the two principals involved. I am not in a position to say whether the general idea could be extended to spinning and weaving but if it could, and the extremes of production could be ironed out throughout the trade, it would reduce costs of production and the price of our goods, improve consistency and delivery and, not least, would have a stabilising influence on both management and labour which would strengthen the industry in every direction.

Cotton Board Conference

Merchant Converting

By F. E. F. SPIEGELBERG†

MY firm were originally mainly concerned with merchant converting for export, but in view of the changing conditions of the trade, we have become more concerned with converting for the home market, carrying large stocks, and distributing as much as possible of these stocks in the export markets. To do this, we have nearly a hundred agents and many travellers visiting the main world markets frequently.

There are thousands of end-uses for cotton goods, but they can be divided roughly into the main categories of apparel goods (men's shirtings, women's dress goods and underwear), then furnishing fabrics, then household textiles, i.e. sheets, pillowcases, etc., and finally industrial cloths. We are mostly concerned today with apparel wear and these are sold through many different channels—wholesale, retail, mail order, and again, some to the making-up industry and some over the counter. The merchant converter's duty is to see that seasonal goods such as these are available in stock, first of all for sampling purposes, and secondly for the bulk seasonal trade, and in women's wear, this, of course, is primarily for spring and summer.

We were helped greatly in pre-war days by having a large export offtake in the southern hemisphere, whose seasons are the reverse to ours, and the markets of Australia, New Zealand, South Africa and the Argentine were keeping merchants and finishers busy at times when they would otherwise have been slack. Owing to these countries having established their own industries, this no longer applies to such an extent, and therefore the impact of seasonal fluctuations in demand has become such a serious problem.

It is fashionable in this country to talk about the weather. May I say, therefore, that 1958 was a very bad summer in this country and in Europe. There were other factors, but this caused very difficult conditions in the autumn of that year. This was followed by the abrogation of the Yarn Spinners' Agreement, and demand and prices collapsed. The summer of 1959 was an exceptionally good one, and this coincided with the redundancy scheme in our industry. Stocks were cleared, and it was apparent that the looms not only of Lancashire but also of Europe and the East would not be sufficient to supply the demand. So we had boom conditions in the autumn of last year, and it has yet to be seen whether our industry has been concentrated too much to cope with the demand which will result from more normal trading.

The problem then, is: how can we, in a free community, persuade buyers to spread the load over the year? I believe that without the merchant converter taking the risks he does, the position would be even more chaotic. But it might be that the other sections of the industry could give some inducement to carry stock and put down large orders at a time when he cannot see a sale for them. There could be another method, and that is that the industry as a whole might form a holding company to put down quantities of standard cloth in times of slackness, which could be drawn on in the busy period. There are many dangers in this, and those who follow me will be quick to point them out. I was concerned in a company formed by the Board of Trade during the war who did such a thing; but war-time conditions are very different from peace-time conditions, and foreign competition was not felt then; and in any case it was obvious that prices were going to rise and not to fall.

I should tremble to think of the situation we should be in if the big buyers in this country were to know that large stocks were held in a falling market when demand was at its lowest. In this age of free enterprise, I feel that competition must still be left to play its part. But I think that as the industry gets more compact, and, it is hoped, more efficient, by working with more modern machinery, longer hours, that more standard cloths will be available; and these are the cloths which can be run week in week out, and which can reduce the cost of production.

To recapitulate, I believe that in the autumn of 1958, when the pipeline of wholesalers, retailers and converters was blocked, owing to the dreadful summer both here and in Europe; when, furthermore, it appeared that a large cotton crop might produce cheaper prices for the raw material; when the political situation was very unsettled; and when it also appeared likely that the Yarn Spinners' Agreement would be invalidated, no amount of artificial assistance would have induced buyers to operate.

† *Chairman, Morreau, Spiegelberg and Thompson Ltd. Director, Manchester Chamber of Commerce.*

Sliver to Yarn Spinning

Results achieved in mill practice by Tweedales and Smalley's direct sliver to yarn spinning system were given by two of the company's representatives at a recent conference at Bolton Technical College. In the paper below, the author dealt with the theory of system, also factors which led to its development and adoption. The other paper will appear in our next issue

By N. HOOPER, A.M.C.T.†

IT would be profitable to commence a discussion on sliver spinning by glancing at the operations performed in a conventional spinning mill. In a very broad sense, the production of a yarn can be divided into three widely differing types of operation, each contributing in its own way to the quality of the final product. These three operations are: (*a*) cleaning, (*b*) parallelisation of the fibres, and (*c*) reduction of the bulk of material down to the required weight of the finished yarn. Whilst it is essential that the first two are carried out effectively, the last—reduction of bulk—is the one intimately related to sliver spinning.

Consider, as a starting point, the sliver produced by the card. Close examination shows that fibres lie at every conceivable angle within the body of the sliver and, moreover, many of these fibres have either leading or trailing hooks. Nevertheless, a card sliver represents the first approach in the mill to producing anything remotely resembling the final product, differing from this in two main essentials. These essentials are: (*a*) the fibre arrangement is not correct and (*b*) there are far too many fibres in the cross-section.

The first fault is corrected by passing the sliver through a series of drawframes, this operation being also used to improve the regularity of the sliver. Regularity at these machines is obtained by efficient drafting systems, coupled with the principles of doubling, and in view of the importance of the latter the number of doublings obtained at these machines is greater than at any other process. The resultant sliver is the most regular product in the mill and forms an admirable baseline from which to start the final operation of reducing the bulk of the material.

When we consider the reduction of bulk, the first question to be answered is—How much basic reduction is required depends on two factors: (*a*) the hank sliver produced at the drawframe and (*b*) the count of yarn it is intended to produce.

Take a fairly typical example. Assume we require to produce 20s counts using a sliver of 0·1 hank, a set of conditions that necessitates a basic reduction of draft between sliver and yarn of 200/1. Prior to the introduction of sliver spinning, this reduction would be obtained in a series of easy stages, the number of stages required being determined by the amount of reduction that could be effectively obtained at each particular stage. The final degree of reduction would be obtained at the spinning machine, the intermediate processes being a series of up to three speedframes. At the second and third passage of speedframe the principles of doubling are again introduced, two ends per spindle being fed into the machine; but unfortunately this has a detrimental effect on the basic reduction originally required.

To quote the previous set of conditions, 20s counts from 0·1 hank sliver, using three speedframe passages would necessitate a total reduction between drawframe sliver and yarn of 800 instead of the basic requirement of 200. So that, to some extent the effect of this doubling is to increase the number of stages required. Whilst, basically, doubling does improve regularity, in so far as its effect on the material being processed is concerned there are also disadvantages in the type of machine in use. These machines, flyer frames are particularly prone to the introduction of irregularity.

Winding tension—a tricky problem—coupled with the increase in draft necessitated by the doubling introduced, means that a reduction in bulk is the only useful function performed on these machines. Economically the number of processes required to effect this bulk reduction is important, each stage requiring machines, operatives and floor space, a factor that considerably influences the cost of yarn production.

In view of this, it is rather obvious that attempts would be made to reduce the number of processes involved and as this can only be achieved by increasing the amount of reduction that can be obtained at any one stage, numerous improved drafting systems have been designed for use on both speed and ring frames.

The ultimate aim is to effect all the reduction required at one process—which brings us to the subject of spinning yarn direct from sliver.

Sliver Spinning

The first important basic factor to be considered is the weight of sliver to be used and we decided a sliver of 0·22 hank or finer would offer a satisfactory solution. A high degree of fibre control during drafting is essential, and slivers coarser than this do not allow sufficient control for satisfactory yarn. Moreover, a fine sliver reduces considerably the amount of basic reduction required, so that a total reduction of 90 is now sufficient instead of the 200 - 800 previously quoted. The effect of sliver spinning is therefore to reduce considerably the amount of draft to which the material is subjected, thereby reducing the number of roller systems through which the material must pass.

A fine sliver produced at the drawframe usually results in low production and, to offset this tendency, the final passage of drawing is arranged to produce two slivers per delivery. Fine slivers are therefore produced without any detrimental effect on drawframe production. Having decided the type of sliver to be produced, two distinct problems face the machinery manufacturer:—

(1) The method of preparing and presenting the sliver to the ringframe.

Counts 20s. Conventional Spinning

Process	3-speed frames	2-speed frames	1-speed frame	Sliver Spinning
Basic Reduction ..	200	200	200	90
Total Draft	800	400	200	90
Doublings	4	2	none	none

(2) Type of drafting system to be used.

The obvious first solution to the first problem is to use a normal drawframe with bi-coil arrangement delivering two slivers per can. These, which could be 12, 14 or 16 ins. dia. and placed at the rear of a single-sided frame would offer a creel supply of 7 to 14 lbs. per spindle. For coarse counts where a large creel supply is of paramount importance, this system can be a reasonably satisfactory solution and machines are operating on this basis. Such a system does, however, involve increased capital expenditure, due to the increased price per spindle of a single-sided frame against double-sided ones, and is also more wasteful in terms of floor space.

Leaving the very coarse end of the trade, single-sided frames become economically unsatisfactory and it is essential that double-sided machines should be made available, a factor that involves the preparation of a suitable type of package with which to feed them. Various types of package have been tried in the past, ranging from the use of normal drawframe cans placed in a room below the ringframe, to small cans placed in special creels above the frame. We eventually decided that a cross wound package offered the most attractive solution, giving a compact

• *Tweedales and Smalley Ltd., Castleton, Lancs.*

package of sufficient weight to bring creeling frequences down to a satisfactory minimum.

A.K.P. Machine

These packages are produced at the final passage of drawframe and for this purpose a special machine has been marketed under the trade name A.K.F. This consists of four deliveries, is fed by eight cans of second passage drawframe sliver per delivery, the slivers being divided into two distinct sets of four before being passed into the drafting system. As sliver regularity assumes an important role special attention has been paid to this and the basic drafting element consists of a two over three system.

The back two rollers, carrying a single top roller and fluted to "Shirley" recommendations, grip the slivers adequately thus preventing any semblance of roller slip, whilst all top rollers are loaded by a spring-loaded weighting arm. The front roller has normal drawframe fluting, the system being basically a single zone system. All top rollers have synthetic covering to ensure concentricity and to enable them to withstand the heavy loading, whilst the roller ends are in roller bearings. In front of the front drafting roller, a further top and bottom roller is placed at a distance of 3½ ins., the space between the two sets of rollers containing a condenser. As the drafted material passes through this zone (condensing zone) the webs from each set of four slivers are consolidated to the width of a single sliver and in this form are delivered by the extra pair of rollers.

Leaving these rollers, the sliver passes through a twisting tube into a set of three calender rollers, then through a guide on to a spool driven by friction through a revolving drum. The guide is stationary but drum and spool receive a quick reciprocating motion which results in the sliver being built up in the form of a cross wound cheese. Each delivery carries its own spool held against the drum by spring pressure, and as two slivers per delivery are produced, the finished package consists of two cheeses wound separately on the spool. The weight of material in each cheese varies according to requirements, the maximum obtainable being 4 lbs.

The twisting tube on this machine is extremely important as it was realised that sliver of 0·2 hank and finer would require some consolidation if a firm package was to be produced and satisfactorily unwound at the ringframe. Various methods of consolidation are available ranging from rubbing as used on condenser cards, false twisting to full twisting, and of these false twisting was considered the most suitable. The primary aim must be to feed into the ringframe drafting system sliver in much the same conditions as it left the drawframe and this method of consolidation was deemed to interfere least with fibre arrangement.

Passing sliver through a revolving trumpet normally inserts no final twist to the material, but on the A.K.P. the method of twisting used, known as the Kruse system, does allow some twist to be retained in the sliver. Sliver passes through a trumpet revolving at approximately 1,400 r.p.m. the bore of the latter being matched to the sliver diameter, so that opposite hands of twist are inserted in the sliver at each side of the trumpet. In addition to revolving at 1,400 r.p.m. it is arranged so that this motion is intermittent, the frequency of stopping and starting being 40 cycles/min., a factor that allows twisted material to pass forward during the stopped period. The net result of this is that the cheese contains lengths of S and Z twisted material, alternating at intervals of some 15 ins.

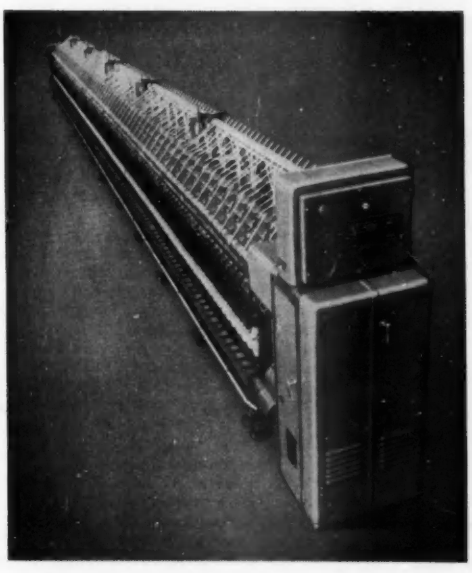
The light alloy twisting tubes fit inside pulleys, in such a position that sliver is fed well into the nip of the calender rollers. A tape passing along the length of the frame drives the pulleys, the tape obtaining its drive from a motor at the end of the machine. This motor—of special design—is controlled by a face cam operating a micro-switch, the drive to the cam being obtained from the calender rollers. Each revolution of the cam represents one complete stopped and running cycle of the motor and twist tubes, and as the cam face is adjustable, the relationship between running and stopped time can be adjusted to the best advantage. To ensure quick stopping of the motor, it is essential that some braking facilities be available and in this instance the design is such that d.c. current is induced into the motor circuit immediately stoppage occurs.

Packaging is performed in a fairly simple manner. The sliver passes through a stationary guide below the calender rollers and is then wound on to a frictionally driven spool. Hydraulic traverse mechanism traverses the drum and spool at a frequency of approximately 40 cycles/min., resulting in the sliver being wound on in a coarse helix formation. The package, spring loaded against the drum, gradually builds up to 12 ins. dia., a "Veeder-Root" indicator measuring the length of material. Immediately the correct length has been measured the machine automatically stops and, after 3 secs., a semi-automatic doffing device takes the finished cheeses out of contact with the driving drums and deposits them in a tray at the foot of the machine. It then remains for the operative to fit empty spools, piece the ends and start the machine, taking away full cheeses when convenient.

A few features on this machine include: suction cleaning to the drafting system; indicator lights to locate faults; spring loading to both drafting and calender rollers; facilities for a fine change at all tension points. These do assist in the production of a satisfactory product.

Spinning

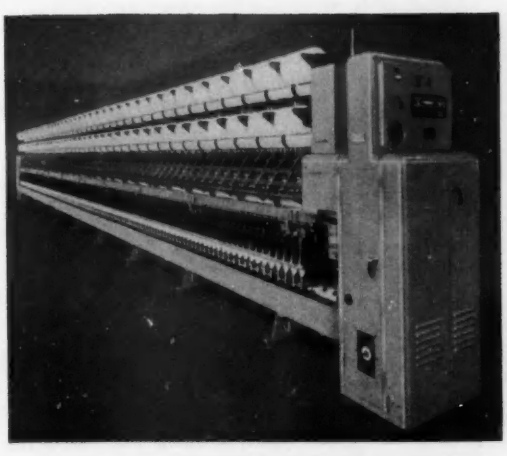
Having produced the packages, the next consideration is how these should be presented to the ringframe—bearing in mind that despite the use of false twist, the sliver lacks real strength. We decided it was essential that the packages should be unwound positively, and for this purpose the frame is fitted with revolving drums driven from the back roller of the drafting system. Two rows of drums per side are used, the packages resting on these and, a point of importance, the take-off position of the sliver on the lower drum is arranged relative to the drafting system, so that the distance is greater than the frequency length of the Kruse twisting. The result of this is that the false twist in the sliver is removed under the effect of the slight tension used in this area, and material completely without twist is presented to the drafting system; being devoid of twist it offers the minimum resistance to drafting.



General views of the two types of machines

(left) A single-sided full length sliver spinning frame

(right) The double-sided full length sliver spinning frame



These remarks apply solely to double-sided machines. Single-sided, being fed by cans offer no problem, cans being placed at the rear of the machine and fed over an assisting roller.

We have, therefore, ideal conditions under which drafting can take place: an even lightweight sliver with fibres parallel and no restriction on fibre movement except that offered by the drafting system. Generally speaking, one of the weaknesses of most types of sliver spinning drafting systems has been their complexity due to the number of loose parts involved. Our system is based on three factors: (*a*) fibre control, (*b*) simplicity of operation and (*c*) versatility. The system is virtually a tandem double-apron system, with sliver being fed through a condensing guide into a pair of apron rollers and drafted by a pair of rollers in front of these. From these rollers the partially drafted material passes through a condensing zone into the nip of a second pair of apron rollers, final draft being obtained by the front rollers.

A two-zone system was considered essential for dealing with sliver as it enables provision to be made for correcting the lateral spreading of the fibres in the back zone. Material delivered by this zone is in the form of a broad band of fibres and the condenser reduces the material to a narrow compact ribbon. In this form it can be readily controlled and drafted in the front zone and the degree of control obtained can be judged by the fact that it has not been found necessary to use a condenser behind the front roller. Material delivered by the front roller is also in the form of a very narrow ribbon, lateral spreading of the fibres having been reduced to a minimum and, consequently, the number of uncontrolled fibres emanating from these is also reduced. Spinning from sliver with a system of this type with its adequate material control is as clean as modern conventional spinning systems and, taking into account the amount of work accomplished, is only a little more complicated.

Complications in drafting systems usually arise from three points:—

(1) Difficulty in keeping a system clean.
(2) Presence of loose condensers.
(3) Necessity for re-setting rollers to accommodate different staples.

All these points have received attention and with the method used for carrying the top rollers, a system far cleaner than the old conventional double apron system has been evolved. Top rollers and top aprons are carried by a roller arm pivoted on a bar at the rear of the system, loading of the rollers being obtained by springs located inside the arm. As the rollers are carried in the centre, no end pivots are necessary, a factor which, in addition to adding to cleanliness also allows the operative to slide away roller laps without removing the roller and also to piece up a broken end behind, instead of in front of the front roller. Top rollers are fitted with roller bearings which require lubrication at very infrequent intervals, a factor that results in less stoppage time, and also avoids the presence of free oil. Synthetic coverings are used for top rollers to enable them to withstand the high loadings involved, and also because of the accuracy to which they can be manufactured and maintained.

Access to the drafting system is obtained by unlocking the arm and pivoting it upwards, an operation that leaves the lower portion of the system readily accessible for any cleaning that may be required. The third point—roller setting—has received special attention and it can be said that virtually all rollers operate at fixed centres. This is not an unreasonable feature to expect from a system of this type and, considering the front zone, it is fairly obvious that this is essentially a normal ringframe double apron system which one would expect to operate at fixed centres. Long bottom aprons are used with spring tension rollers and as the bottom apron passes over a curved nose bar both aprons are held in close contact with each other.

Special mention should be made of this feature as it constitutes one of the reasons for the success of the system. Using a double apron system, with the aprons held in contact only at the points of front reversal at the driving roller nip, there does exist a tendency for the apron to remain apart between these points. Passing the lower apron over a curved control bar eliminates this tendency, results in contact between the aprons over a considerably increased area and gives a higher degree of fibre control. The short top apron is held in contact with the bottom at the point where it passes over the bar by a light spring which acts in the apron cradle, the intensity of the pressure between the aprons at this point being determined by a plastic projection on the underside of the cradle.

This is the variable feature, which is by no means critical, that enables staples up to 40 mm. and all counts of yarn to be processed without recourse to roller setting. If a system of this type was used on conventional spinning it would be quite within reason to expect drafts of up to 30 and as the conditions under which it operates on sliver spinning are less arduous due to the absence of twist in the material, drafts of this degree are permissible.

The back zone is a replica of the front zone, but due to the bulkier material with which it deals the setting between the two rollers is slightly wider and the intensity of the aprons pressure is reduced. Normally a fixed setting is used, but provision is made to open this setting $\frac{1}{4}$ in. should abnormal circumstances arise, a factor that is extremely unlikely. It is reasonable to regard this zone as a speedframe drafting system, and as a point of fact many speedframes are operating with a system identical to this, and giving exceptionally good results using drafts up to 16. At present, the maximum draft that we should require would be approximately 8, so the system is far from being fully extended.

As the total draft is the product of the back and front drafts, the system is therefore easily capable of drafts up to 240, which would produce 60s counts from 0·25 hank sliver. Allocation of drafts between the two zones depends on the total draft and the minimum draft required in the back zone would be 3·5 a condition resembling very closely that obtained on a Slubbing Frame and this would be used on counts of 7s.

Weighting of the roller is, as previously stated, obtained by springs inside the roller arms, the total pressure being 40 kilos divided amongst the rollers in the following manner: reading from front to back—

10·1 K, 8·6 K, 10·65 K, 10·65 K.

Whilst this system is capable of dealing with staples up to 1 $\frac{5}{8}$ ins., which includes the bulk of cottons and the shorter synthetics, it was inevitable that sliver spinning would attract users of longer staples. A system based on the same principles has therefore been developed for processing 2$\frac{1}{2}$ ins. staple; this only varies from the cotton system in that roller centres are wider and aprons longer. Results obtained on this system spinning coarse counts compare very favourably with yarns spun on a conventional system.

Having developed a system for producing yarns from sliver in a satisfactory manner and yet maintaining reasonable simplicity, the time was opportune to investigate the possibility of further simplification within the generally established principles. This has resulted in simplifications in both drafting zones, that in the front being obtained by the substitution of a short bottom apron for the long one now in use, and in the back by the use of drafting rollers instead of double aprons.

Considering firstly the front zone, the short apron passes over the normal nose bar and straight back to the driving roller without the use of a tension device thus presenting a considerably simplified arrangement. Roller drafting in the back zone has proved satisfactory for the lower ranges of draft, and by the removal of aprons here again greater simplicity has been obtained. It must be mentioned in this connection that this alteration does mean that it now becomes necessary to set the back roller to suit the staple length of the material being processed. This should not prove detrimental as the setting, due to the low speed of the rollers and the bulk of material being processed, is by no means critical and it is assumed that normally staple length used on these machines would not vary to any great extent, in any particular mill. These latter improvements, which are intended solely for simplification of the system, whilst not yet in production will eventually be available.

Types of Machines

The types of machine to which sliver spinning is being fitted are modern narrow ringframes with package sizes ranging from 9×2 ins. to 12×3 ins., all designed for optimum spinning conditions. Basically, they can be divided into two types—single- and double-sided—the type chosen usually being dependent on the counts it is intended to process. Taking the double-sided machine first, this would be our standard R.F.N. machine fitted with two rows of driving drums per side to carry the cross-wound cheeses, adequate provision being made for permitting fine changes in the tension between the cheeses and the drafting system. Provision would also be made for carrying overhead cleaners as we consider it essential in a modern system of spinning that cleaning should be done mechanically and not by the operative. The employment of these also removes the necessity of fitting clearers on the top of the drafting system with the exception of a clearer for the front roller, thus giving the operative an unobstructed view of the rollers. Suction underclearers to the front roller are fitted as standard equipment as one would expect on a modern machine, the ducting actually being an integral part of the frame.

Spindle driving can be one of three systems: (*a*) a standard tape drive with under-slung jockey pulley, (*b*) the Sussen single spindle drive, and (*c*) the Hispano Suiza spindle drive. Floor space in a

(*continued on page* 494)

Fig. 1(a). Jute plants (courtesy, Jute Industry Research Assn.)

Fibres Today—8

Vegetable Fibres

Classification of commercial vegetable fibres, the physical properties of jute, flax, ramie, soft hemp, coir and sisal, also the processing techniques and extremely wide range of uses

By J. W. S. HEARLE, M.A., PH.D., A.INST.P., F.T.I.*

FIBRES extracted from plants have given men a great variety of textile materials. If all local uses are included, the list of useful vegetable fibres would be extremely long—one publication has actually listed 1,926 different plant species utilised for this purpose—but only a few play an important part in world trade. They can conveniently be classified into four categories: (*a*) bast fibres, (*b*) leaf fibres, (*c*) seed fibres and (*d*) wood fibres. They are arranged in this pattern in Table 1, with figures of their total annual production. The bast fibres—derived from the stems of plants—are soft, flexible, and fine. By contrast, the leaf fibres, which come from structural units crossing the leaves, are hard and coarse. Consequently, they are mainly used for cords, ropes, and similar applications which are apart from the main stream of textile technology. The seed fibres, which are non-structural and form part of the seed coats of plants, include the all-important cotton fibre (already described in earlier articles in this series) and one or two others with specialised uses. Wood fibres cannot be separated as fibres for textile processing, and will not be dealt with in this article, except to record their importance as a raw material for paper-making and for rayon production.

Table 1. Classification of Commercial Vegetable Fibres

Class	Common name	Botanical name	World production million lbs. p.a.
Bast (or soft) fibres	jute	corchorus sp. ..	4,400
	flax	linum usitatissimum	1,400
	soft (true) hemp	cannabis sativa ..	650
	sunn fibre	crotalaria juncea ..	250
	ramie	boehmeria nivea ..	—
	kenaf (mesta)	hibiscus cannabinus	440
	Congo jute	urena lobata.. ..	25
Leaf (or hard) fibres	sisal	agave sisalana ..	1,100
	henequen	agave fourcroydes ..	250
	Manila hemp (abaca)	musa textilis ..	250
	palma istle	yucca carnerosana..	28
	Mauritius hemp (aloe)	furcraea gigantea ..	4
	New Zealand hemp	phormium tenax ..	10
	cantala (maguey)	agave cantala ..	—
Seed fibres	cotton ..	.. ..	19,000
	coir	cocos nucifera ..	400
	kapok ..	.. ..	40

* *Manchester College of Science and Technology.*

Jute

In the scale of production, jute is undoubtedly the most important vegetable fibre after cotton. Although it is a fibre which has been in constant use since ancient times—for instance as the "sack-cloth" mentioned in the Bible—

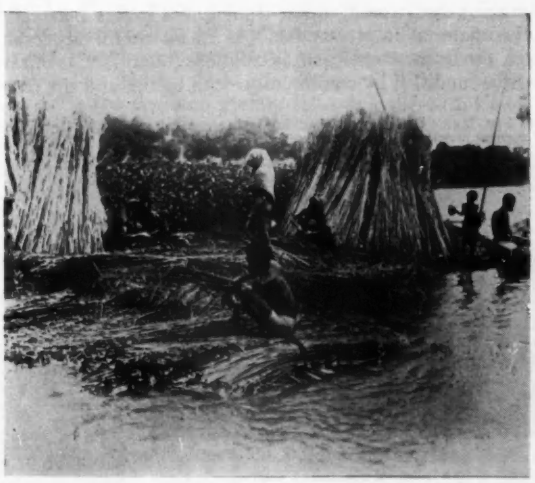


Fig. 1(b). Retting jute (courtesy, Jute Industry Research Assn.)

Table 2. Physical Properties of Vegetable Fibres

	Jute	Flax	Ramie	Soft hemp	Coir	Sisal
Tenacity, g./tex ..	29	55	66	56	18	40
Breaking extension, %	2	3	4	2	16	1·9
Work of rupture, g./tex	—	0·9	—	—	1·6	—
Elastic recovery from						
half breaking load	0·7	0·65	0·5	0·5	—	—
half breaking ext.	0·7	0·7	0·5	0·5	—	—
Wet strength / Dry strength × 100%	—	105	118	—	—	—
Density, g./c.c. ..	1·48	1·50	1·51	1·48	—	—
Refractive index						
light vibration, ∥ axis	—	1·60	1·60	—	—	—
light vibration, ⊥ axis	—	1·53	1·53	—	—	—

(left) Fig. 1(c). Sorting jute (courtesy, Government of Pakistan Information Service)

jute was not brought to Britain until 1764, and the Dundee industry did not really start before 1832. Jute is grown in the hot, humid regions around Calcutta as annual plants growing anything from 5 to 16 ft. in height as shown in Fig. 1(*a*). After harvesting the stalks are soaked in water (Fig. 1(*b*) until the destructive action of bacteria makes it easy to wash the fibres just below the bark, away from the rest of the stalk. This process of *retting*, illustrated in Fig. 1(*b*), is employed for a number of vegetable fibres and it serves to remove gummy substances and bits of stalk and bark from the fibres. After retting, the jute fibre strands are sorted (Fig. 1(*c*)) and dried in air, before being shipped to the mills (Fig. 1(*d*)).

Although jute will grow in many humid tropical and sub-tropical regions, most of the commercial production of the fibre is in India and Pakistan. As India also processes over 50% of the world's jute, and is a net importer of raw jute, the sole exporter is Pakistan.

Commercial jute fibre consists of strands in which the individual fibre cells occur in bundles along the whole length of the stalk. The individual cells are between 8 and 30 μ dia., and between 0·8 and 6 mm. in length; while the strands, shown in lateral and cross-section view in Figs. 2(*a*) and 2(*b*), are between 6 and 10 ft. long and contain between 6 and 20 fibres in their cross-section. Because the individual fibre cells are so short, it is important to ensure that the strands are not completely broken-up during processing and, among other things, this makes bleaching of the material impracticable. As in all useful vegetable fibres, the major constituent is cellulose (60 to 70%); but in jute it is modified by combination with lignin, and the fibre also contains significant amounts of other substances. The fibres are yellowish brown in colour but, although they cannot be bleached satisfactorily, they can be dyed to bright colours.

The physical and chemical properties of jute are summarised in Table 2 and Fig. 3. The fibre is inextensible, but has a fairly high tensile strength. Jute is pliable and easily manufactured, but it is not a hardwearing material

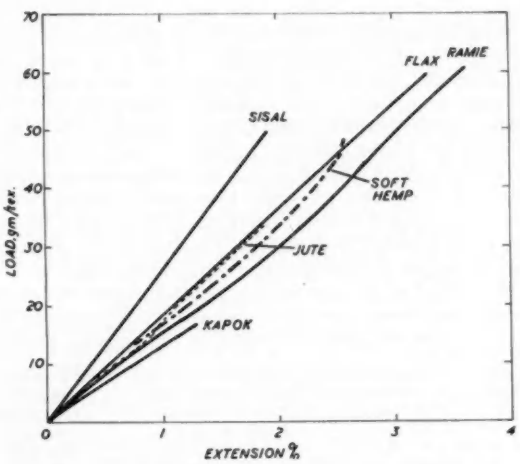
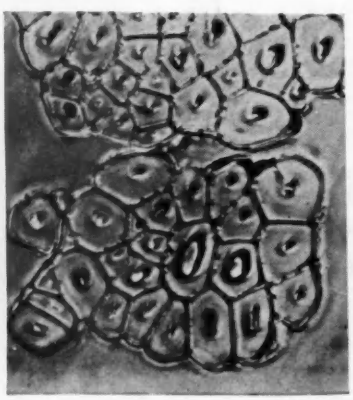


Fig. 3. Load extension curves of vegetable fibres

(centre) Fig. 2(a). Cross-section of jute fibre strands (×600 approx.) (courtesy, Jute Industry Research Assn.)

Fig. 1(d). Ferrying jute bales to the port (courtesy, Government of Pakistan Information Service)



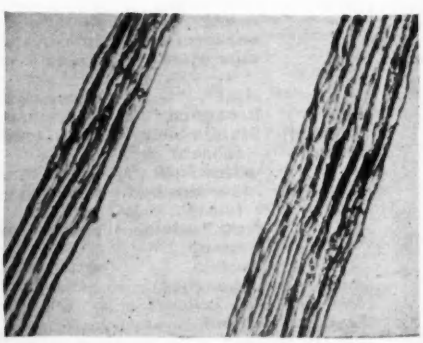


Fig. 2(b). Lateral view of jute fibre strands (×136 approx.) (courtesy, Jute Industry Research Assn.)

above) Fig. 4(a). Jute sacks used in the potato harvest (courtesy British Jute Trade Federal Council)

(right) Fig. 4(b). Finished linoleum backed with jute hessian (courtesy, British Jute Trade Federal Council)

since the abrasion resistance is poor, and the fibre is easily degraded by light, by chemicals, and by bacteria, mildew, and other sources of microbiological rotting. Because of its coarse nature, colour, and poor durability, jute is only used for coarse textiles where its low price is its decisive asset. Two typical end-uses are shown in Figs. 4(*a*) and 4(*b*). As a fabric, jute is used in large quantities for bags and wrappings, as a backing for linoleum, also for furniture webbing, tailors' padding, etc. As yarn, it is used in cordage and twines, and is woven into the backing of carpets. The relative importance of these uses is shown by the figures for the annual consumption in Britain, namely 220 million lbs. as sacks, 55 million lbs. as other cloths, and 70 million lbs. sold as yarn.

The price of raw jute in Dundee is about £95 per ton, i.e. 10d./lb., which is roughly a third of the price of cotton. As there is no evidence of the possible production of any competing fibre which is equally cheap, the future for jute seems steady—although the greatest threat comes from the use of non-textile containers such as paper bags or plastic films, and in changing methods of distribution and transport of commodities.

Other fibres similar to jute are kenaf or mesta and Congo jute. Kenaf can be grown further North, and production is being encouraged in the U.S.S.R., Brazil, Cuba, and the U.S.A., as well as in its traditional locations in China, India and the Pacific Islands.

Flax

In contrast to jute, flax is a costly, high-quality fibre, likely to suffer from increasingly serious competition from cotton and the man-made fibres. It was probably the first vegetable fibre to be used for textile purposes, and the remains of linen fabrics have been found in prehistoric Swiss lake dwellings. Flax is cultivated in temperate climates, as an annual plant growing 3 to 4 ft. in height. The same plant may be grown either for seed or fibres. For linseed production, short varieties are used and the plants are spaced so as to give branching growth, while for flax fibre production tall varieties are grown with the plants close together in order to give straight slender stalks. The harvesting is usually carried out by hand (Fig. 5), and is followed by a sequence of operations needed to extract the fibre bundles which lie just below the bark as shown in Fig. 6.

The first operation, retting (Fig. 7) may be carried out either naturally in streams or ponds, or under closely controlled alkaline conditions in tanks. This takes four days or more but during the process the fibre bundles are freed from the unwanted cellular tissue. The next operation —scutching—separates the fibre bundles from the shive, or woody portions of bark and stalk. This is done by breaking the stems at many places along their length in a mechanical breaker, and then passing them through a scutching mill to remove the broken pieces of shive. The final preparatory process is hackling (Fig. 8) which, in effect, is a coarse combing operation with steel or wooden pins, intended to soften the fibre and to remove short fibres. The waste from these two operations—scutching tow and hackling tow—may be used for spinning into coarse yarns, or for paper-making. The world production of flax is summarised in Table 3. Although 80% of the world's flax is grown in Russia, the largest exporter—and the supplier of high-quality flax to the U.K. is Belgium. Flax growing in the U.K. has declined greatly following the withdrawal of Government support in 1956.

Table 3. World Production of Flax

	Thousand tons p.a. Scutched basis
Soviet Union	443
Poland	53
Czechoslovakia	20
France	29
Belgium	23
Netherlands	17
Roumania	10
East Germany	10
Other countries	41

Flax is composed of 70% pure cellulose together with other miscellaneous materials. The commercial fibre consists of strands between 6 and 40 ins. long (usually 15 to 25 ins.), and 2 to 20 thousandths of an inch in diameter, made up of individual fibre cells which are

Fig. 5. Harvesting flax in N. Ireland (courtesy, Irish Linen Guild)

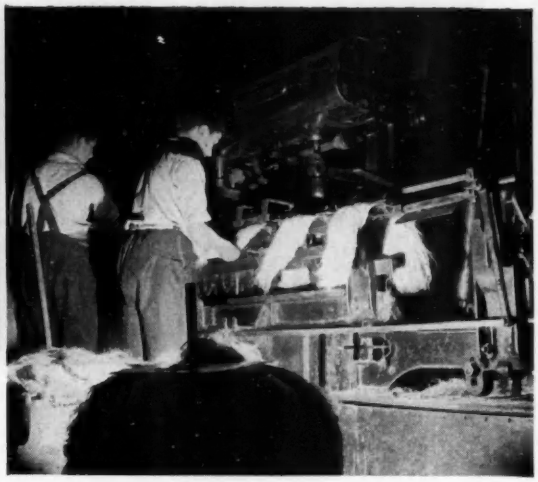


Fig. 8. Hackling of flax (courtesy, Irish Linen Guild)

9 to 70 mm. long and 5 to 40 μ thick. During scutching and hackling, in the wet spinning of fine yarns, and in the bleaching and finishing of fabrics, a partial or complete separation of the bundles into separate fibres may occur; but the fibre cells are so long and fine, that this serves to enhance the quality of the yarn, whereas in jute the cells are so short that the yarn would not hold together. Typical fibres from bleached linen are shown in Fig. 9. Flax fibres are lustrous and have a creamy white colour which can be appreciated in unbleached linen, but they can be bleached to a pure white or dyed. As suggested by the figures in Table 2 and Fig. 3, flax is strong and inextensible, and absorbs water well. It is very hard-wearing and durable, and has a good resistance to attack by moisture or mildew.

The sequence of stages in the transition from flax straw to high-quality linen is shown in Fig. 10 and typical examples of the types of fabrics produced are shown in Fig. 11. Apart from its use as a speciality dress and furnishing fabric and such household uses as the best tablecloths, napkins, and towels, flax can be used for industrial uses where specially high strength, durability, and inextensibility are needed. Typical examples are industrial sewing-threads and fire hoses. The price quoted for Belgian flax has steadily fallen from £477 per ton in 1951 to £135 per ton in 1958; Russian flax was £114 per ton in 1958. At 15d. per lb. this price may seem very low, but it is the price for retted fibre; and the subsequent processing of flax is longer and more expensive than that of cotton. With the higher prices in the early 1950's, flax was an expensive fibre, occupying a similar (though less extreme) place among the vegetable fibres to silk among

Fig. 10. Stages in the production of linen: flax straw, scutched fibre, hackled fibre, bleached yarn and finished fabric (courtesy, Irish Linen Guild)

Fig. 7. Retting flax (courtesy, Irish Linen Guild)

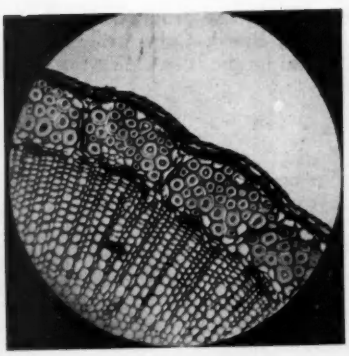


Fig. 6. Section of flax stem showing bundles of fibre cells below the surface (courtesy, Linen Industry Research Assn.)

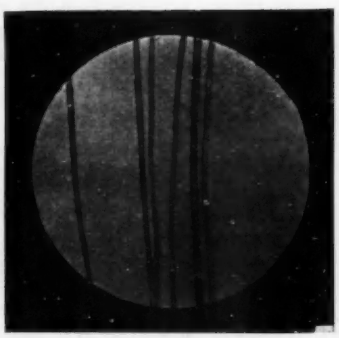


Fig. 9. Flax fibre from bleached linen (courtesy, Linen Industry Research Assn.)

Fig. 13. Hanging manila fibres in the sun for drying (courtesy, Shell Photographic Unit)

(left) Fig. 11. Linen table cloths and napkins (courtesy, Irish Linen Guild)

the animal fibres, and subject to severe competition on the grounds of price from cotton and rayon, and on technical properties from the synthetic fibres. As a consequence of this, the industrial uses of flax seem likely to diminish. In addition, fresh habits of life which will not put up with the high cost or the care needed in laundering table linen are also acting against flax. If flax is to maintain its place as an important fibre, vigorous promotion is needed to keep linen in fashion, and to popularise and exploit the aesthetic appeal of linen fabrics. In the meantime, it is doubtful whether it is economically sound to produce flax in Western Europe at the low prices prevailing in 1958, although since then there has been an increase in demand for flax and some recovery in price.

Hemp and Sunn Fibre

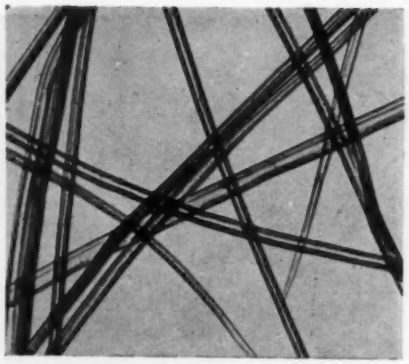
Soft or true hemp is another bast fibre similar in production, preparation, form, and properties to flax, but not of such a high quality. Until the nineteenth century, hemp was the chief cordage fibre in Europe, but this place has been lost in competition with cheaper fibres. The production of hemp is less than a third that of flax. The biggest growers are Russia and Eastern Europe, although Italy is the most important exporter. Hemp is used mainly for cordage, although fine fabrics, similar to linen, can be made from good quality Italian hemp. In general, hemp is not an economical crop to grow, and it will probably decline still further in importance. Sunn fibre (or sunn hemp) is another fibre of a similar type, although not as strong or durable as flax or hemp. Grown in India in fairly large quantities, some of the fibre is used for cordage and rug yarns, but the bulk goes into papermaking.

Ramie

Ramie is a fibre which has never been produced in any but fairly small quantities and it is a fibre of perpetual promise, which will probably remain unfulfilled. The ramie plant is a variety of stingless nettle grown mainly in China and Indo-China, although agriculturally successful trials have been carried out in Brazil, U.S.A., the Phillipines and other countries. The plant is propagated by root cuttings which is a method needing a considerable labour force. Attempts have been made to mechanise the tedious hand process of removing the fibre from the stalk but they have not been altogether successful.

(left) Fig. 12. Stripping an Abaca stalk (courtesy, Shell Photographic Unit)

(right) Fig. 14. Abaca production in Borneo (courtesy, Shell Photographic Unit)



(left) Fig. 15. Ultimate fibres of Manila hemp (×85 approx.) (courtesy, Tropical Products Institute)

(right) Fig. 16(a). Harvesting leaves from the plant which produces Mauritius hemp (courtesy, Mauritius Information Service)

A description of the properties of ramie (Table 2) is a collection of superlatives—it has all the typical qualities of bast fibres in a superior form. The fibres are very white, and lustrous; are stronger than flax; and are very durable, showing exceptional resistance to bacteria and fungi. The individual fibre cells are very long—from 2½ to 12 ins.—and the degummed fibre is a very pure form of cellulose (96 to 98%). Ramie is used for strong, durable twines, and for furnishing and other fabrics. Because it is expensive to produce, and difficult to process on machinery designed for other fibres, the production and use of ramie is unlikely to develop further unless the Chinese economy concentrates on it. Although ramie has attracted a lot of publicity in the West, the times are not appropriate for the introduction of a new natural fibre, competing with food crops, and unsuitable for mechanised farming and preparation.

Manila Hemp

Manila hemp (or abaca) is traditionally the best fibre for ropes, particularly marine ropes. The plant is a perennial with leaf stalks growing 12 to 25 ft. high from a central root system. In order to extract the fibre the stalks are broken down into strips (Fig. 12) and then into strands which are hung in the sun to dry (Fig. 13). Manila hemp is produced mainly in the Phillipines, but it is also grown in Borneo (Fig. 14). The fibre cells, shown in Fig. 15, occur as bundles from 3 to 9 ft. long, and their colour varies from white to dark brown. They are composed mainly (65%) of cellulose and are strong and inextensible. Two other fibres similar to Manila hemp, but not so important are Mauritius hemp and New Zealand hemp. Figs. 16(*a*) and 16(*b*) show harvesting of the leaves in Mauritius and the decorticating machine employed to extract the fibre.

Sisal, Henequen, and Istle

Although it is inferior in quality, sisal is produced in greater quantities than Manila hemp. As illustrated in Fig. 17(a) the broad leaves of the plant grow from a short trunk. After stripping the leaves, and extracting the fibres, the strands are dried in the sun (Fig. 17(b)). Sisal is grown fairly extensively in the tropics, with the two major producers being Tanganyika and Brazil. The strands of sisal are 2 to 5 ft. long, and range in colour from white to brown. Composed mainly of lignified cellulose, they are not as strong or as resistant to sea-water as Manila hemp. Sisal is used mainly for ropes and twines, but sisal matting can be obtained in exciting new colours and designs and is competing in the present boom in floor coverings.

(left) Fig. 16(b). Use of decorticating machine to extract fibre from Mauritius hemp (courtesy, Mauritius Information Service)

(right) Fig. 17(a). Sisal growing in Tanganyika (courtesy, Shell Photographic Unit)

Fig. 17(b). Drying sisal in Kenya (courtesy, Tropical Products Institute)

There are various commercial fibres which are similar to sisal. Cantala (or Maguey) and henequen both come from the same botanical family as sisal, the agaves, and originate in Mexico. Also from Mexico come the istle fibres derived from several different plants, with palma istle being the most important. All these fibres compete with sisal in utilisation for ropes and cordage.

With all these hard leaf fibres, one of the major problems is the extraction of the fibre from the leaf. Where labour is plentiful and this can be done by hand it is satisfactory, but the use of mechanical decorticating methods is being extensively explored, as illustrated in Fig. 16(*b*).

Coir and Kapok

The two seed fibres—coir and kapok—are perhaps only classified as textile fibres with some straining of the definition. Coir is extracted from the husks of coconuts, grown in India and Ceylon, by soaking them in water for 5 days and then passing them through a breaker. It is a coarse fibre used for brushes and matting. Kapok, which is produced fairly widely in the tropics, is a very bulky fibre, with thin walls and a large void space. It is soft, brittle and inelastic and cannot be spun into yarn. The fibres are 0·3 to 1·25 ins. long and 30 to 36 μ in diameter. They are impermeable to water and are used as a filling in bedding, upholstery, life-buoys and life-belts.

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For Further Reading

Long Vegetable Fibres, by L. Weindling, New York, Columbia University Press, 1947.

The Technology of Cordage Fibres and Rope, by D. Himmelfarb, London, Leonard Hill (Books) Ltd., 1957.

Reviews

HONG KONG COMMERCE, INDUSTRY AND FINANCE DIRECTORY, 1960. Hong Kong Government Office, Grand Buildings, Trafalgar Square, London, W.C.2. (free of charge on payment of 1s. 2d. postage).

The C.I.F. Directory is a publication remarkable not only for the wealth of information it contains but also for its illustrations, many in colour. Chapters on the colony's industries and primary production are accompanied by notes on the documentation of exports and imports, port facilities and warehousing, together with details of public utilities, trade organisations and promotion services. Finally, there is a good classified directory of Hong Kong produced commodities.

S.P.S.

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GUIDE TO THE IDENTIFICATION OF ANIMAL FIBRES. H. M. Appleyard. Wool Industries Research Association, Torridon, Headingley, Leeds 6. (price 42s.)

In this guide, textual matter has been cut to the minimum as detailed descriptions of the preparation of fibres for examination and systems of nomenclature are available in the companion volume "The Microscopy of Animal Textile Fibres", by Dr. A. B. Wildman (W.I.R.A., 1954). This guide has been produced as a laboratory manual designed to meet the requirements of workers already possessing laboratory skills. Fibres from forty-four different species of mammals are described in the tables of fibre features, which is arranged in alphabetical order of animals producing the fibres. There are three hundred and fifty-two excellent illustrations, in which the magnification used is limited to 200X for whole mounts and fibre cross-sections and to 400X for scale casts, thus providing comparison both for diameter and the distance between scale margins.

S.P.S.

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EINKOMMEN UND TEXTILVERBRAUCH (Income and Textile Consumption). by Dr. H. H. Kaup. Westdeutscher Verlag Köln und Opladen. No. 819. 1960 (price DM 23.20)

The purpose of this work was to analyse the economic factors controlling consumption of textiles and to attempt predicting future trends. Use is made of statistics published in the U.S.A. and in other countries and a certain tendency was discovered that consumption of textiles declines as a percentage of income with increasing affluency of society. The reason is that other consumer goods, especially private transport, assume greater importance as a social factor. There is also a tendency to dress less formally and hence less need to buy special clothes for special occasions. The improvement in durability of textiles also plays a part. Two methods of foretelling future trends are discussed and the whole is documented by considerable statistical data.

B.S.

MASSANDERUNG UND FASERBEANSPRUCHUNG VON WASCHESTOFFEN BEI VERSCHIEDENEN TROCKNUNGS-VERFAHREN (Dimensional Changes and Fibre Damage as a Consequence of Various Drying Techniques After Laundering). By Dr. O. Viertel. Westdeutscher Verlag Koln and Opladen. No. 850. 1960 (price DM 10.70.)

A study was made of the effect of various drying techniques, such as air drying, ironing, calendering, pressing and tumbling on shrinkage and fibre damage. Two methods of laundering were used, namely with stationary and rotating goods. Washing in a rotary machine causes greater shrinkage than when the goods are kept stationary. Tumbling invariably causes considerably more shrinkage than any other technique but this dimensional change is reversible on subsequent wetting and drying by any of the other techniques. Compressively shrunk fabrics exceed the permitted limits only when tumbler-dried. Excessive drying in the tumbler causes more shrinkage still.

Knitted goods are preferably dried in the tumbler to counteract stretch in one direction. Tests for chemical damage reveal that fibre attack only takes place when drying at temperatures exceeding 160°C. The text is amplified by many tables and diagrams. There are also some references to the literature and it is surprising that the exhaustive contributions by Shirley Institute to this subject are not mentioned.

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INKS AND THE SCREEN PROCESS. This is the title of a very interesting, attractively produced booklet of 34 pages from Coates Brothers Inks Ltd., Easton Street, Rosebery Avenue, London, W.C.1. It covers

the screen printing process (basic principles), equipment, the stencil, mechanisation and semi-mechanisation, and screen process printing inks.

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HANDBOOK OF COMMERCE AND INDUSTRY IN NIGERIA. Fourth ed., 1960. Crown Agents for Overseas Governments and Administrations, 4 Millbank, London, S.W.1 (price 16s. 6d., post free).

It is particularly appropriate that the new edition of this handbook should be issued by the Federal Ministry of Commerce and Industry in a larger and more comprehensive form at the time when Nigeria has achieved independent status. For anyone interested in Nigeria, whether for business or any other reasons, this book is essential to a proper understanding of conditions in the country. Its 352 pages are full of just the kind of information necessary to answer the many queries raised by businessmen and others concerning the responsibilities of Federal and Regional Governments and the appropriate departments concerned with particular subjects; with external trade and its regulation; public revenue and expenditure; opportunities for investment; and climatology and facilities for visitors and tourists.

A detachable supplement contains plans of the principal towns and maps showing the country's rail and road communications and the locations of industries, minerals and agricultural developments.

S.P.S.

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DIE BEWETTERUNG CHEMISCH MODIFIZIERTER WOLLGARNE (Weathering of Chemically Modified Wool Yarn). by Dr. H. Pfannmüller and Prof. H. Zahn. Westdeutscher Verlag Köln and Opladen. No. 816. (price DM 10.10).

The effect of 15 different chemical modifications of wool on its resistance to weathering was studied. It is concluded that a true protective action is achieved only by building into the keratine molecule such groups which are capable of absorbing light radiation in such a manner that it would not effect any chemical changes. Aromatic compounds are most effective. Fibre damage can be counteracted by cross linking the molecular chains. Maximum resistance to weathering is achieved by combining both effects. On the successful application of these principles to wool will depend its continued use for purposes where weathering plays an important part.

B.S.

ERMITTLUNG DES GEBRAUCHSWERTES VON HANDTUCHERN VERSCHIEDENER QUALITAT (Determination of the Utility of Various Qualities of Towels). by J. Ilg. Westdeutscher Verlag Köln and Opladen. No. 865. 1960 (price DM 13.20).

Twenty-nine different qualities of towels made from cotton, cotton/rayon mixtures and cotton/linen mixtures were investigated in respect of strength, resistance to rubbing, absorbency, soiling and cleansing after one and repeated washings. The towels were not used in-between washes. Five different laundries were used in the experiment. It was found that after 100 washes towels made from American cotton behaved best, cotton/rayon and cotton/linen mixtures less well. Borders in twill weave should preferably be made in a 4:1 twill. There was little difference in absorbency after three launderings. Resistance to rubbing was better with towels made from pure cotton than with cotton/linen towels.

Soiling and soil removal tests were inconclusive..

B.S.

Recent Trade Literature

NITRILE RUBBER AT WORK. The impact now made on modern industry by the increasing use of Hycar nitrile rubbers and latices is well demonstrated in a new publication by British Geon Ltd., Devonshire House, Piccadilly, London, W.1. Entitled "The Hycar Rubber Story", the booklet shows how these butadiene/acrylonitrile rubbers are making more things possible in many different fields. In engineering for example, the oil resistance and good mechanical properties of Hycar are relied upon in countless applications involving contact between oil and rubber. Non-woven fabrics are bonded with Hycar latex, while Hycar-based leather finishes are claimed to give greater durability and improved appearance to almost every type of leather.

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POWER ON THE BENCH. The "Multifix' multipurpose apparatus described in a new booklet from Loughborough Glass Co., Ltd., Loughborough, seems to have a limitless range of uses. The multi-purpose motor is the basis of the whole range of laboratory and workshop devices which make up this versatile equipment. It can be arranged to stir, drill, pump, bore corks, and bungs, saw, grind and polish, and has the luxury of an infinitely variable speed control in either direction.

• • •

SPECIALITY FASTENERS, NUTS, ETC. A new range of technical literature covering the products of the company's Advanced Design Division is now available from Unbrako Socket Screw Co. Ltd., P.O. Box 38, Burnaby Road, Coventry. Extremely informative and well produced, they are of considerable interest to all engineers and technicians. These product leaflets cover high temperature all metal stiffnuts, Hi-Torque titanium fasteners, one piece all metal stiffnuts, Hi-Torque fasteners, high temperature fasteners, high temperature bolts in Ninsonic 80A, external wrenching bolts, and 12 point titanium fasteners.

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ODOUR CONTROL. A valuable publication concerning this problem is available from May and Baker Ltd., Dagenham, Essex. Dealing with the technique of odour control, with special reference to "Alamask", it enumerates the causes of industrial malodours, methods of control, application of "Alamask" compounds and, in the next section, with methods of treatment in various industries, etc. Technical advice is readily available on application of these products.

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INTERNAL TELEPHONE SYSTEM. Staff location and efficient methods of internal communication are now more important than ever in modern industry. An illustrated folder released by Hadley Telephone and Sound Systems Ltd., Cape Hill, Smethwick, Staffs., gives information on their complete internal telephone system from two to thirty lines, this system enables the master station to have quick communication directly to every point without calls going through the switchboard.

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FIXING DEVICES AND CAULKING COMPOUNDS. A small, neat folder from Expandite Ltd., Chase Road, London, N.W.10, gives brief details and illustrates applications of their range specialities. These include masonry drills, anchor and expanding bolts, screwing inserts, caulking compounds, plugs, tile-fixing material, and other fixing devices.

• • •

MECHANICAL HANDLING SCHEMES. Selections from the wide range of complete handling schemes devised and installed by Herbert Morris Ltd., Loughborough, appear in a new publication No. 242. Amongst the many examples are two textile applications (a) an installation at one of the factories of J. and P. Coats Ltd., handling yarn packages and cartons, etc., and (b) in another mill where a Morris overhead chain conveyor scheme serves two floors for carrying full and empty cans of card sliver.

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KITON FAST BLUE C.R.B. Samples of dyed wool yarn, woolpiece, wool carpet yarn and spun nylon yarn are shown in a new publication (C.D.C. 90) issue by Ciba Clayton Ltd., Manchester 11. Kiton Fast Blue C.R.B. is of particular interest for dyeing bright blue shades on wool; cotton and cellulosic rayon effects are reserved. Suitable for dyeing nylon, it is said to give dyeings of good light fastness in self shades. It is unsuitable for discharge styles but maintains its shade in artificial light.

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AIR COMPRESSORS. Leaflet C.B.193—a distinctive publication released by B.E.N. Patents Ltd., High Wycombe, Bucks., —illustrates a wide range of units with supporting data on performance, pressure, h.p. requirements, air receiver capacity, dimensions and weight. Designed to enable potential buyers to readily select the best unit for a specific job, it gives the specifications in both British and metric measurements.

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TEMPERATURE, ETC., MEASUREMENT.—Two new publications have been released by Negretti and Zambra Ltd., 122 Regent Street, London, W.1. One (catalogue reference T44/G) is a German version of the company's mercury-in-steel recording thermometer pamphlet, which is being widely distributed in W. Germany.

The second is a new Indian version of the general catalogue entitled "Instruments for Use by Indian Industries" which is to be circulated throughout India and Ceylon by Bell's Asbestos & Engineering (India) Private Ltd.

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

New Dropper Pinning Machine Works in or away from Loom

Requiring only one operative, preparation on the W.I.R.A. machine takes about 5 mins. for warps of 3,000 to 7,000 ends with up to 100 ends/in.

THE W.I.R.A. dropper pinning machine designed by the Wool Industries Research Association and now being made by Hobourn-F.N.F. Ltd., Burton-on-Trent, pins (in or away from the loom) woollen, fancy worsted or cotton warps that have an end-and-end lease, without extending the warp sheet and so disturbing either its tension or the position of the fell. The machine handles open-ended droppers in varying widths and thicknesses commonly used by the majority of the industry for either electrical or mechanical stop motions. Drop wires Mo 1 to Mo 6 and Eo 1 to Eo 6 specified in B.S. 2609: 1955 are examples of types ideal for use in the machine. Other widths and thicknesses of droppers can be used in the same design of machine. but different thicknesses must not be used at the same time. The use of very long or very short droppers must be referred to the machine makers. Droppers $\frac{11}{16}$ in. wide and $5\frac{1}{4}$ ins. long commonly used on C. and K. looms can also be accommodated.

The W.I.R.A. machine will accommodate droppers that have been distorted by a mechanical warp stop motion. A cleaning bin for use with a cold solvent is available to ensure that the droppers are clean. Warps and leases must be straight before pinning and generally some cloth must be woven to remove tension differences from end to end. Extra rollers carrying striping or "name edge" ends do not present any difficulty other than a possible rearrangement to facilitate manipulation of the machine or equipment. The whole pinning process with this machine can be performed by one operative.

The total time for preparation, pinning, checking and setting up for weaving varies according to the type of warp and loom, the skill of the operative, and the condition of the droppers, the stop motion bars and the warp; but average figures are available from experience in mills.

The preparation, which needs only one operative, takes about 5 mins. for warps of 3,000 to 7,000 ends with up to about 100 ends per inch; warps of higher sett and warps with name edges on separate bobbins take slightly longer to prepare. The time for the actual pinning process depends on the number of ends in the warp and the speed of the machine. Running speeds of 200 - 250 ends/min. are recommended and, allowing for stoppages, the pinning rate is about 5 mins. per 1,000 ends; checking the warp and setting up for weaving takes 15 - 20 mins. If lease rods are required in the warp during weaving a modified checking method is used which takes 2 to 3 mins. longer. On average the loom is stopped about 10 mins. for every 1,000 ends pinned.

Warps can also be pinned away from the loom in some twisting frames, or in a special frame. The warp then requires brushing, clamping and tensioning which involves some extra time, varying according to the type of warp and the number of heald shafts. It is then pinned in the same way as in the loom. The droppers and stop motion bars are clamped together and covered for storage and

The compact, highly efficient W.I.R.A. dropper pinning machine at work in the loom. It handles open-ended droppers in varying width and thicknesses

transport. The complete equipment is carried on a wheeled trolley designed for easy transport from loom to loom and carrying all that is required for pinning warps in the loom.

To prepare the warp for pinning it is only necessary to position the two lease rods and insert two combs which control the width of the warp. The track, which is light enough to be carried by one man, is then placed on the loom, where it is clamped to the back rail, and supported by the crankshaft. The strip assembly is fastened to the track, and the gauges which locate the leases relative to it are inserted. Pinning can be started when the machine has been placed on the track and loaded with droppers; these are placed on 2, 4 or 6 delivery chutes which each hold about 500 droppers 0·008 in. thick.

The machine has three adjustments; one for the number of rows to be pinned, one for the ends per inch of the warp, and one for the speed of pinning. The adjustment for either 2, 4 or 6 rows is easily made before pinning commences. The distance the machine moves along the warp for each end that is pinned is set according to the c.p.i. of the warp, and any rate of traverse can be provided. Any of four running speeds from 50 to 250 ends/min. can be selected at any time and the machine can be inched, started or stopped from the control panel. A handle is provided for manual rotation of the motor shaft extension when needed.

While pinning is in progress the operative must supervise the running of the machine. Any "flats" in the end-and-end lease are pinned as a single end and the machine does not stop for them. Droppers which are delivered when no end is selected for pinning are collected underneath the warp. The omission of an end selector stop motion simplifies the mechanism without introducing a great deal of extra work for the operative. Occasionally the magazine must be refilled with droppers and the position of the machine checked by means of the indicator provided. The machine will stop if a faulty dropper is presented for selection and when the magazine needs refilling.

When all the ends are pinned, the machine, track and accessories are replaced on the trolley, the separating strips and the droppers being left on the warp for checking. The array of droppers and spacer strips is then arranged in the most convenient position to clear obstructions on the loom while inserting the stop motion bars. After this has been done the spacer strip assembly is removed and the bars holding the droppers are moved to their working positions.

The track is made of light alloy and weighs about 40 lbs. The machine, which weighs 26 lbs., consists of five units: the driving unit, control panel, end selector, dropper magazine and traverse mechanism. It is driven by a 50 volt power supply through a transformer from single phase mains.

The end selector transfers each warp end in turn from the "unpinned" position to a "pinning" position and then removes the end to the "pinned" position. At the same time the magazine delivers one dropper from the appropriate bank on to each end whilst this end is stationary in the "pinning" position. The driving unit contains the motor and gear box, and the traverse mechanism moves the machine along the track from left to right.

Each of the five units can be separately removed for maintenance or replacement, and their timing relative to one another is indicated by timing marks. This "unit" construction simplifies maintenance by the user of the machine and allows rapid replacement of parts.

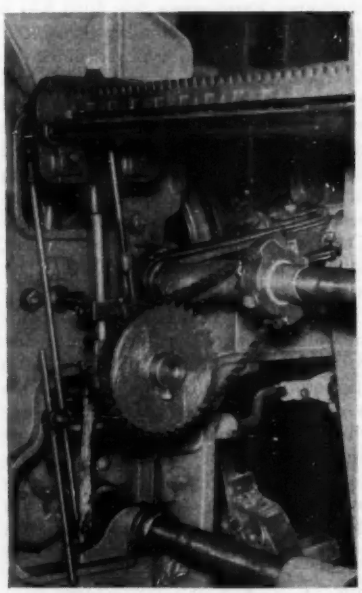
Several W.I.R.A. machines have been in use for nearly four years in Yorkshire mills, handling warps of woollen, worsted and wool/"Terylene," and mixed warps containing silk and cotton decorative yarns, in setts varying from 20 to 200 e.p.i. over a wide range of counts. Together these machines have pinned over 10,000 warps. Satisfactory mill trials have been made with cotton warps, but no extensive performance data for rayon fibres are yet available from mill experience.

Automatic Warp Stop Motions

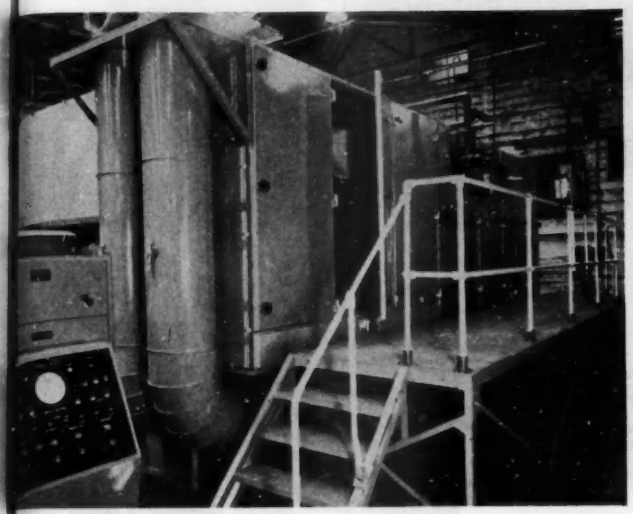
THE advantages of a warp stop motion are fully recognised in weaving sections of the industry as a means of substantially reducing mending costs, increasing production and reducing the weaver's work per loom, thus allowing more looms per weaver. The illustration shows the latest "Hudson-Argus" automatic warp stop motion as supplied for pick-and-pick looms of the Dobcross and Hattersley standard type. The mechanism is fully machined and interchangeable and every effort has been made to ensure that the motion will operate for long periods without the need for maintenance.

The mechanism is positive throughout and has a new positive chain drive from the loom crankshaft. The chain drives an eccentric immediately below the headstock and this eccentric provides the movement for the headstock levers and the sliding bars. The knock-off assembly is also positive being a series of shafts linking the headstock directly to the loom starting handle. These shafts are all linked by universal joints which remove all strain and are supported in self-aligning and self-lubricating bearings. The positive knock-off provides a broken-end indicator which allows the weaver to locate the broken thread from the front of the loom. This frequently saves the weaver a journey to the back of the loom and is most important in multi-loom weaving.

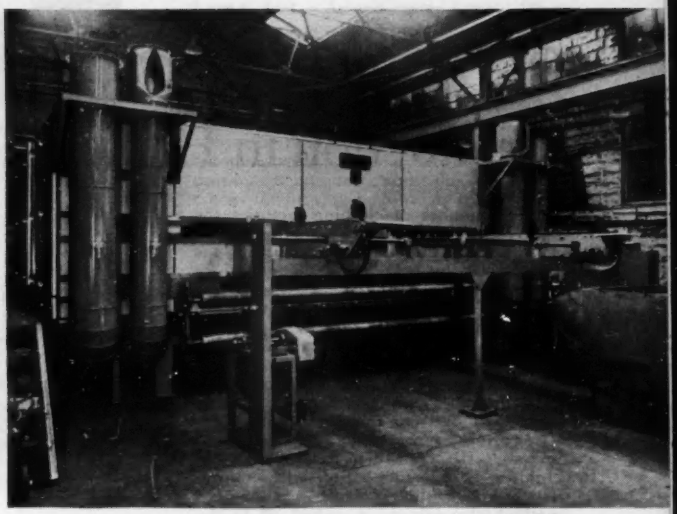
The headstock incorporates a weave-in clutch which allows the sliding bars to be easily put out of action during the weaving-in of a new warp when slack ends are common. Since the chain drive is entirely positive no loss of efficiency due to slipping can occur and the positive knock-off will retain its adjustment indefinitely. Self-lubricating bearings are used extensively and all shafts are linked by universal joints to reduce strain. Wear and tear is, consequently, reduced to a minimum. The motion is virtually maintenance free and offers the advantages of an electric warp stop motion in respect of reduced wear and tear.



The "Hudson/Argus" motion



showing cabinet with automatic push-button controls, also the inspection doors and the catwalk along the side



Front view of the new Spooner stenter. A specially designed nozzle system directs air on to both sides of the carpet in each pass

New Stenter for Tufted Carpeting

DESIGNED specifically for the carpet industry the latest stenter announced by Spooner Dryer and Engineering Co. Ltd., Ilkley, is a three-section, two-pass machine designed to handle tufted carpet 9 ft. wide with almost infinite width variation to a maximum of 15 ft. and, it is claimed, eliminating many of the problems experienced with snaking, cockling and wastage when trimming. It also dispenses with the need to iron the carpet pile. The machine is complete with drying sections suitable for drying and curing after latex or plastic applications, and drying after dyeing or printing.

On this latest stenter the heating zones are gas-fired using the latest and most efficient blown burners complete with full control equipment. Alternatively steam, electric or oil heating can be supplied. Absolute uniformity of air distribution is achieved throughout the whole drying area by using a specially designed nozzle system, the air being directed onto both sides of the carpet in each pass.

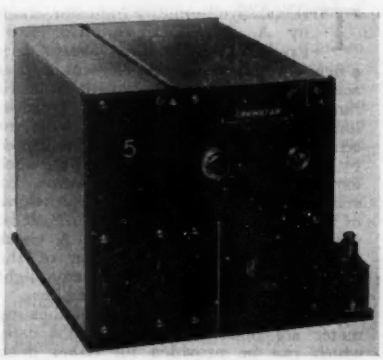
Three high efficiency Spooner axial flow fans, each fitted with a 10 h.p. motor, are used to re-circulate the air, Internal ductwork is kept to a minimum and air filters are fitted into the return air circuit. The total heating length is 46 ft. the whole being totally encased with fume tight insulated panels, many of which are hinged to provide ready access for maintenance. For economy of floor space, the cooling section is fitted underneath the drying section on the pass to the leaving end.

All the mechanisms are of special heavy duty construction. The machine is equipped with automatic guiders, power operated widening gear and fully machined chain rails with detachable thrust faces of heavy section. The chains are of fine quality malleable iron, Driven support rollers are fitted in both heating passes with freely rotating rollers and draw rollers at the end of the bottom return pass. A variable speed drive unit is fitted. Push button centralised controls are provided in a free standing control cabinet at the front of the machine.

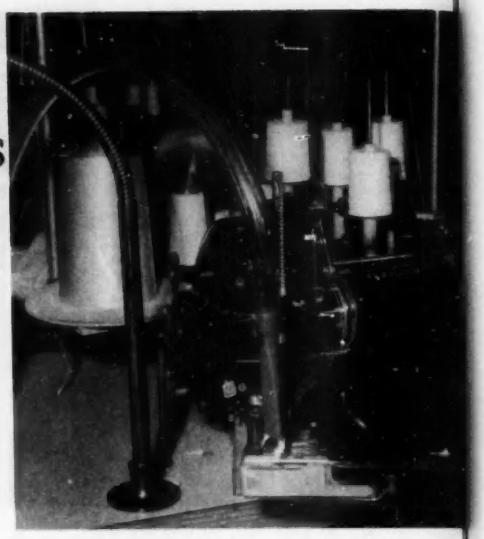
New Predetermined Batch Unit

EXCEPTIONALLY long life is one of many advantages claimed for a new high-speed electric predetermined batch unit —plug-in construction—shown by Trumeter Co. Ltd., Milltown Street, Radcliffe, nr. Manchester, at a recent factory equipment exhibition. The basis of the unit is a high-speed step motor of novel construction. Comparatively small in overall size the unit has large digits; on the model shown they are $\frac{1}{4}$ ins. in height, but they can be varied if required. The figures can also be illuminated.

Featuring the external knob method of setting up the batch, the unit is designed to count up to 3,000 per min., and it is equipped with press-button re-setting, should this be necessary in the middle of a batch. The output pulse between batches can also be varied slightly depending on the exact application of the unit, although the resetting time is constant. The unit can also be coupled, where necessary, to other electrical read-out counter facilities (digital display, etc.).



Vacuum Cleaners Increase Production in Hosiery Factories

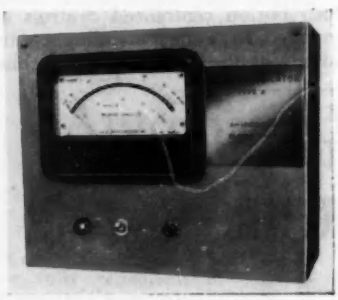


Pipelines connected to portable vacuum cleaners automatically suck waste from the sewing machines

IN a number of clothing factories the problem of salvage—the unwanted snippets, clippings and threads—is now solved by bringing vacuum cleaners into the production line. At the hosiery works of N. Corah (St. Margarets) Ltd., these vacuum machines are now piped to the work benches so that all unwanted material is automatically sucked away immediately it leaves the sewing machines. The machines are multi-thread models which sew and cut salvage automatically. The garments made-up are mostly cotton, including sports shirts underwear and children's garments, the salvage from which is valuable. With the vacuumation method, this salvage is sucked off to the filter bag in the container of the vacuum cleaner, the working bench is kept clean and the salvage is whisked away before it can get soiled or spoilt.

This simple example of automation is popular all round. The girls like it because, they no longer lose productive time in clearing the benches and disposing of waste. Employers like it too, because it means more and smoother production and waste which can be sold more profitably as it is spotlessly clean. The vacuum cleaners are industrial models made by the British Vacuum Cleaner and Engineering Co. Ltd., Goblin Works, Leatherhead, Surrey. These powerful machines can be piped to suck waste from as many as 18 sewing machines simultaneously, giving ample suction at each end of the nozzles provided. It might be thought that handling cloth, stoppages would occur in the pipelines, but this is not the case as the long strips of salvage travel one at a time in the air stream and are not picked up in lumps or bunches. These B.V.C. machines are kept running at least 8 hours per day during normal production periods. The pipeline which connects them with the sewing machines consists of a straight run of 2 ins. P.V.C. pipe to which is joined transparent polythene tubing to make the final connection with the machines This tubing terminates in a plastic nozzle similar to that of the crevice tool of a domestic vacuum cleaner, and this is fixed right next to the needles of the sewing machine. The threads and salvage are sucked up and can be seen flapping about in the transparent tubing until the garment is finished and the final cut is made, when it shoots away and quickly travels to its container.

Relative Humidity Indicator



THE relative humidity indicator, made by A. M. Lock and Co. Ltd., Prudential Buildings, Oldham, uses a new type plastic sensing element, to give accurate humidity measurement over the range 10—100% R.H. It has excellent long term calibration stability, and the sensing element is claimed to be unaffected by most chemical vapours or by prolonged exposure to 100% R.H. conditions. The standard indicating meter has a scale length of 5 ins. and is calibrated directly in % R.H. with an accuracy of ± 3%. A check position enables the calibration of the instrument to be checked, and any slight long term variations compensated for.

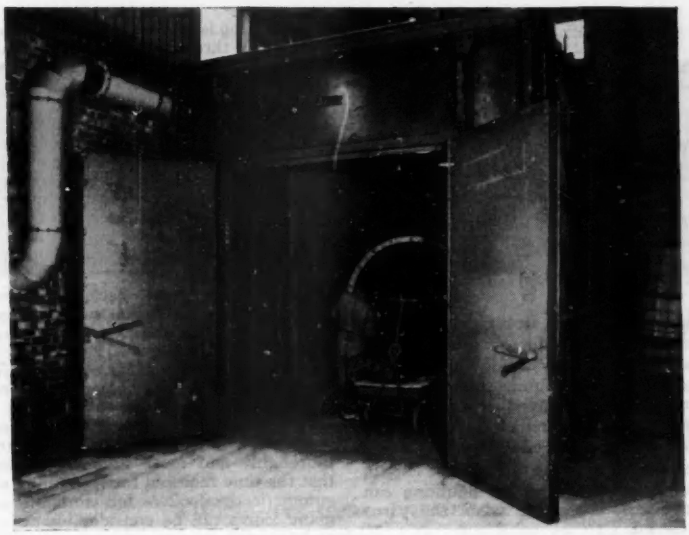
The measuring circuits and indicating meter are housed in a dust-tight case, which can be provided for either flush panel or wall mounting. This unit also contains the stabilising circuits for the sensing element, precision resistor for calibration checking, and a read/check spring-loaded toggle switch and calibration adjustment control. The read/check toggle switch is arranged so that the instrument cannot be inadvertently left in the check position. The measuring indicator unit can be mounted in any convenient position, and it is recommended that the length of screened lead to the sensing element be kept as short as convenient. Two scale calibrations are available, each covering 10—100%, but are of different scale shape; scale "A" is recommended for use over range 10—60% R.H. and scale "B" for use over 30—100% R.H.

The humidity indicator provides a D.C. output of 1—10 micro amps. for operating a remotely-mounted meter or recorder. Two types of recorder can be supplied; a 3 ins. strip-chart type gives four weeks' recording at a chart speed of 1 ins. per hour, and the alternative circular chart type has 6 ins. dia. daily charts. The length of connecting lead between the recorder and the measuring indicator unit is not important. A multi-element selector switch allows up to six elements to be connected in turn to the one indicator.

Solenoid Valves for Flow Systems

TO be used in flow systems as an on/off control where the maximum flow rate is 525 ml. per min. at 60 cm. head of water, the Grundy solenoid valve marketed by Griffin and George Ltd., Ealing Road, Alperton Middlesex, is a cylindrical glass valve with a metal cored glass plunger, actuated by a concentric solenoid from a mains control unit. The glass valve has an overall length of 110 mm. and is cylindrical, being 70 mm. long by 16 mm. dia. with riffled extensions to accommodate 5 mm. dia. tubing.

The cylinder contains a metal-cored glass plunger with a ground glass plug at one end which sits into the ground surface at the constricted outlet of the valve. The glass valve is mounted through the solenoid which is housed in a metal casting, 90 mm. dia., 57 mm. long, with an integral boss-head to accommodate rods of up to ¼ in. dia. The control unit, housed in a sheet metal case 6¾ ins. wide by 9 ins. in depth, is a step-down mains transformer tapped at 12V. with three circuits for controlling simultaneously (up to) three solenoids for operation on 200/250 V. at 50 cycles A.C.



The new automatic shot-blasting cabinet will accommodate work up to 30 × 12 × 12 ft.

Protective Coating of Heavy Equipment

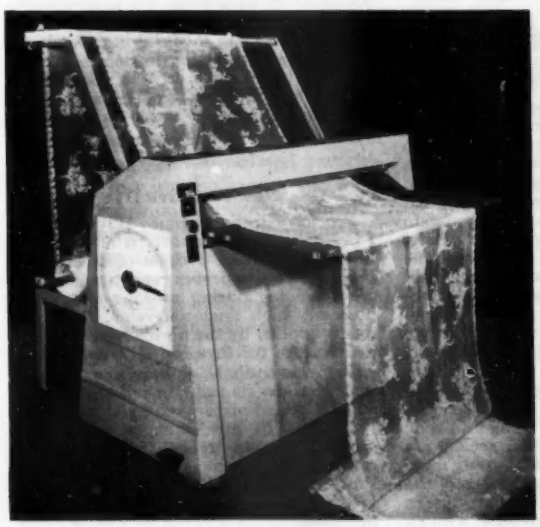
THE application of a comprehensive range of anti-corrosion and protective coatings to heavy equipment up to 5 tons in weight, under factory conditions, has now been established in Manchester. The new service is based on specialised plant recently installed at Norton Street, Miles Platting, Manchester, by West's-Loyne Ltd., a company jointly formed by W.G.I. Ltd., (West's Group of Industries), Manchester, and Loyne Ltd., Ashton-under-Lyne. The plant, which is adjacent to the main works of the West's Group, includes one of the largest fully-automatic shot-blasting cabinets installed in Britain for this kind of work and a large gas-fired oven for sintering and stoving coatings, or heat treatment of metals. The installation is complete with up-to-date preparation and coating equipment and the necessary cranes for moving large items while under treatment.

Among the coatings applied are:—Epoxy resins (for the lining of vessels containing food, oil or chemicals); phenolics (water and acid resistant); synthetic rubber (abrasion resistance and corrosion prevention); P.T.F.E. (non-stick dispersion coatings for a variety of uses in industrial and domestic equipment); P.T.F.C.E. (insulation and resistant to high temperatures and corrosive gases and acids); silicones (non-stick, heat and chemical resistant); metal spraying (zinc, aluminium, stainless steel); flame spraying (polythene, nylon, P.V.C.).

The gas-fired oven at the new plant is 30 ft. long, 12 ft. wide and 10 ft. high, and is designed for sintering P.T.F.E. and P.T.F.C.E. and for stoving high-bake epoxy, phenolic and silicone coatings. A temperature of 450°C. can be attained when needed for heat treatment of metal if required before P.T.F.E. coating. Provision is also made for curing coatings by hot air and infra-red heaters. Other facilities available, include the shot blasting of large vessels in the open with mineral grit and if required work can be prepared by flame cleaning and power wire brushing. Both powder and wire metal spray guns are used for flame spraying zinc, aluminium and stainless steel as well as for the synthetic coatings.

High Precision Cutting Machine

A NEW machine designed primarily for curtains and drapery manufacturers called the tilt-table cutting machine has recently been announced by the Sjöström Machine Co., Boca Raton, Florida, U.S.A. This machine, which is 5 ft. long, 5 ft. wide and 5 ft. high is useful for any type of textile which must be cut on the cut line and eliminates the walking up and down which a cutter makes when cutting on a conventional table.



5 ft. long, 5 ft. wide and 5 ft. high, this new machine has been designed to handle any type of fabric which must be cut on the line

The material is fed through nip rollers and the pointer is set to the length desired (20 in. to 130 in.). The operator presses the start button and the feed rollers feed the exact length past the operator and down the table which is tilted downward at a 30° angle when the rolls are feeding. When the feed rollers come to a stop—2 secs. for an 84 in. length—the table comes horizontal and the operator makes the cut on the cut line of the materials. If the operator takes 2 secs. to make the cut which is customary, a production of 15 cuts/min. is feasible.

Accurate lengths to less than $\frac{1}{8}$ in. in 120 in. is claimed by the manufacturer. The measuring box consists of a clutch plate with micro switch sensitive to 1/1,000 in. As there is a 10 to 1 ratio between the feed rollers and the measuring box, the theoretical error would be 10/1,000 in. Actually the lengths are $\pm \frac{1}{16}$ in. due to vagaries in different types of textiles.

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Change of Address

Shirley Developments Ltd. have moved to Saxone House, 52-56 Market Street, Manchester 1 (Tel.: DEA 7706).

Recent Research Developments

Special exhibits on the recent members day at Shirley Institute included the lap weight regulator, beam tension regulator and standard loom settings

IT is desirable that the weight per unit length of scutcher laps shall be as constant as possible. A regulating mechanism has been used on scutchers for nearly 100 years and this, together with suitable arrangements for feeding material to the scutcher, enables short-term variations in the weight per unit length of scutcher laps to be kept small. But the same methods cannot reliably be used to control long-term variations in this quantity which are caused by, for example, variations in the hardness of bales of cotton or in the length of time cotton has been standing before being fed to the scutcher. These long-term changes in scutcher laps cause count variation which, in turn, causes cloth defects and inefficiencies in production.

In an attempt to minimise long-term effects of this kind, the present practice is for an operative continually to adjust the speed of the feed rollers of the scutcher in accordance with the weight of the laps being produced. Even with the most skilful operative, this system is only partially effective and it is still necessary in most mills to reject laps that are too heavy or too light. This is partly because the operative cannot take any corrective action until at least one lap has been made after an adjustment has become necessary, and partly because he has no objective indication of the magnitude of the correction required.

The Shirley–N.R.D.C. lap weight regulator makes the control of scutcher laps automatic and quite independent of operative skill. The thickness of the delivered lap is continuously monitored—by means of electrical micrometers—and if it deviates from the desired value a small servo-motor adjusts the speed of the feed roller until the desired thickness is attained. The closed-loop or feedback control system thus formed responds to very small errors in lap thickness and is capable of controlling the mean weight per unit length of scutcher laps to within about ½% at any time. Over long periods, the accuracy of control is even better than this.

The improved regulator can be fitted to any conventional scutcher as an addition to the existing regulator mechanism. With the Shirley–N.R.D.C. lap weight regulator in use, it is no longer necessary to produce at least one defective lap before corrective action can be taken: any errors are dealt with in a length of a few yards of lap, and in a way that is completely objective and independent of the human factor.

Beam Tension Regulator

One problem that arises in doubling yarns from beams is that the means usually employed to brake the beam are such that the tension in the ends as they are withdrawn from the beam increases as the beam empties. In turn, this increase of tension causes a reduction in the amount of yarn wound on to the doubler bobbins so that, in general, bobbins from successive doffings contain different lengths of yarn. As yarn from several doffings may be needed to form one weaver's beam, each end on which must be of the same length, tension variations in beam doubling can cause excessive wastage when the yarns are beamed.

The tension variation and the resultant wastage can be greatly reduced by the use of the beam tension regulator. The beam is supported on castor rollers and the usual ruffle weights for braking the beam are replaced by a weighted paddle pressing on to the surface of the yarn on the beam, the geometry of the system being such that the braking pressure is constant and independent of the beam diameter. Thus the tension in the ends withdrawn from the beam also remains constant.

Standard Loom Settings

With the increasing introduction of multi-shift working one aspect of the Lancashire industry is dying out. This is the tradition of one overlooker being responsible for the maintenance of a particular groups of looms. Under this system, differences in training, experience, and personal judgments of the men were of relatively little importance. Where multi-shift working is in force, looms are adjusted by two or three men in turn, and difficulties arise where personal judgments are not in agreement.

It is well known that looms will run within wide ranges of adjustments of their many parts. There is no group of absolute "best" settings, but groups of "suitable compromise" settings for all loom parts can be defined. When such a system of standard settings has been evolved and applied, all subsequent adjustments are made to either ruler or gauge measurements.

In this manner the effects of individual influences on the loom are minimised, looms behave more consistently, diagnosis of the causes of faults is more rapid and positive, and overlookers on the various shifts work in greater agreement. Among other advantages to be gained from the use of standard settings are that apprentice overlookers can be more readily, more thoroughly and more uniformly trained, that the time required for re-training non-automatic overlookers for work on automatic looms can be considerably reduced and that the rate of replacement of such consumable parts as pickers and picking sticks can be reduced to a minimum.

To be effective, it is essential that any scheme of standard settings should conform to the following requirements:—

(1) It must be acceptable to, and be prepared in co-operation with the overlookers.
(2) It must be comprehensive, since the omission of any one detail may prevent other specified settings from being effective.
(3) It should not require the overlooker to carry about with him an excessive number of gauges.
(4) Where settings are interdependent, the correct order of making the adjustments must be defined.
(5) It should be capable of accepting the inevitable differences arising from manufacturing tolerances.

Shirley Institute is introducing standard settings schemes based on the above requirements in a number of mills.

Direct Sliver to Yarn Spinning

(*continued from page* 480)

lengthwise direction has been reduced as much as possible by driving the frame at the out-end by a motor fitted underneath the spindle rail, so that no extra space is taken up by the motor drive.

Single-sided frames are normally fed from bi-coil drawframe cans, this system being adopted for two reasons: firstly, because this represents an economic method of producing fine slivers and secondly to save floor space at the ring-frame. The cans are placed at the rear of the machine and the sliver passed over a driven-assisting roller direct into the drafting system. These machines can again be divided according to the type of spindle drive employed, the three previously mentioned systems being available. Machines have been designed specifically on a single-sided basis to incorporate these drives and advantage has been taken of the absence of tin rollers in both the Sussen and Hispano Suiza system to build a much narrower frame than would normally be possible. In mills where the pillar spacing is such that advantage can be taken of this fact, the extra cost involved in these drives is off-set by the saving in floor space. A similar type of motor drive to that used on the double-sided machine is used, again with saving in floor space as the main theme.

New Reactive Dye

Procion Brilliant Blue H5G, a new I.C.I. turquoise speciality, is of particular interest to printers because of its excellent building-up properties and its freedom from staining during washing-off; it also possesses high tinctorial value. The new dye is applied by the normally recommended recipes for Procion "H" dyes, using either conventional or emulsion thickenings. Besides its value in self-shades, it is suitable for admixture with yellow Procion "H" dyes to give a range of brilliant greens. In the dyeing field, the high tinctorial strength and low affinity of Procion Brilliant Blue H5G will be of greatest value in continuous dyeing processes.

THE TEXTILE
COLOURIST & FINISHER

Important Factors in Wash-and-Wear Finishing Techniques

Wash-and-wear properties are not confined to any single type of fibre or fabric. In deciding the best treatments many factors must be fully considered and, in this article, the author discusses recent research trends that point the way to new and improved methods of processing

By B. C. M. DORSET

FINISHERS of cotton and rayon materials are now well occupied with processes to confer the most satisfactory wash-and-wear characteristics and the demand continues for all kinds of apparel cloths that can be laundered and dried with little or no ironing and yet have an acceptable smooth appearance for immediate wear. The ultimate idea is that fabrics and garments should be self-smoothing in the drying which follows washing and thus make ironing unnecessary. This aspect of textile finishing is probably receiving more attention in the research laboratory and also in the works than any other and it is to be noted that similar interest is now being shown in the production of wash-and-wear wool goods.

Synthetic fibre materials have natural wash-and-wear characteristics and this difference has stimulated a world-wide interest in discovering the most efficient finishing methods to modify the properties of cellulose fibres and to make them compare more favourably in this respect with the synthetic fibres. Present indications are that the excellent wash-and-wear characteristics of synthetic fibre goods are closely associated with the fact that synthetic fibres such as nylon and "Terylene" are strongly hydrophobic and swell so little when wetted. One line of research in the discovery of wash-and-wear finishes for cellulose fibre goods thus lies in seeking treatments which will make such fibres less hydrophile and thus more inert towards water. It is believed that the making of hydrophobic cotton and rayon fibres would constitute an important step towards the production of more satisfactory wash-and-wear articles made from these fibres. So far this aim has not yet been achieved but considerable progress has been made.

From the commencement of the wash-and-wear finishing of cellulose fibre materials it has been recognised that crease-resist finishing methods can be of the greatest assistance and in fact it is often assumed that crease-resist and wash-and-wear finishing processes are much the same thing. This is a mistake which recently has become much clearer; it is not satisfactory to apply the usual crease-resist finish and expect to obtain the most satisfactory wash-and-wear finish. There are definite reasons for this and some might usefully be considered at this point.

Hitherto a crease-resist finish such as can be obtained by applying to the fabric a urea- or melamine-formaldehyde resin or one of the several so-called "reactants" whose main effect is to cross-link the cellulose molecules within the fibre has been mainly considered from the viewpoint of *dry* creasing. But for a fabric to have satisfactory wash-and-wear characteristics it should be resistant to both *dry* and *wet* creasing since it has been found that wet creases can persist through the drying process and so spoil the appearance of a washed and dried fabric—yet this same fabric may have acceptable resistance to dry creasing. Some recent investigations into the ways in which creases arise in the home washing of cotton materials has shown that the spin-dryer can be a main cause. If cotton fabric is washed in the usual way and at this stage be substantially free from creases it can, when freed from excess of water by spin-drying, become so definitely creased in this operation that when the fabric is shaken out and dried in open width many of the creases remain.

From the above it is evident that resistance to wet creasing must be obtained additional to dry crease resistance if cotton and rayon goods are to be given a really satisfactory wash-and-wear character. Recent recognition of this important point has now resulted in considerable attention being given to it and furthermore the whole subject of crease formation and shedding is now being studied. It is surprising how one-sided has been the attention given in the past to crease-resist finishing with its concentration on *dry* rather than *wet* creasing.

However, it must not be considered that ordinary crease-resist finishes do not give wet crease resistance simultaneously with the dry crease resistance for which in the past they have primarily been applied. They do confer wet crease resistance but not to the maximum degree possible,

unless specially modified. This modification can involve either the resin composition used or the use of entirely new products or a special treatment of the cellulose fibre material to enable it to be more responsive to the resin treatment applied. Recent researches have been largely directed along these lines and have secured considerable success.

Mention has already been made about the connection between the wash-and-wear characteristics of synthetic fibre materials and the hydrophobic nature of such fibres. It seems reasonable to suppose that by making cellulose fibres less hydrophile a step can be taken to improve their wash-and-wear characteristics. Experience has shown that any treatment which produces a cross-linking of the cellulose molecules within a cotton or rayon fibre has the effect of making it less reactive towards water so that on wetting the modified fibre absorbs less water and has its normal wet swelling properties restricted to a corresponding degree. If a fabric is so modified then it invariably acquires increased dimensional stability so that it shrinks less and is less liable to distortion of shape during washing Since with wash-and-wear finished articles it is required that these should not only resist wet and dry creasing but should also resist shrinkage and shape distortion, the inference is that it will be advantageous in such articles for a reasonable degree of molecular cross-linking to be obtained. This indicates how important can be the choice of the resin or reactant employed to give crease resistance for there is a considerable difference between such agents in respect of the amount of cross-linking they produce.

Crease resistance and dimensional stability in cellulose fibre fabrics can be obtained by one or other of two treatments—either with a resin or reactant or with formaldehyde, aided by the presence of a catalyst which is generally required to be acidic and thus unfortunately liable to tender the cellulose fibres. Experience over many years has shown that the effect obtained in applying these alternative agents depends essentially on the amount of water present at the time the agent reacts with the fibres. From the viewpoint of securing a high degree of dry crease resistance it is necessary for substantially anhydrous conditions to exist and this explains how it is that in crease-resist treatments the most important stage is that generally known as curing. In this stage of treatment the fabric impregnated with a resin precondensate or with formaldehyde is in a substantially dry state exposed for a few minutes to a temperature of about 150°C.

Factors Affecting Results

It is not difficult to understand how the presence of water in a crease-resist treatment using a resin or other agent such as formaldehyde must materially affect the result. Considering a cotton fibre it is known that this is highly crystalline and that in the crystalline parts the cellulose molecules are tightly packed together so that it is difficult for any substance, even water, to penetrate the small spaces between them. A viscose rayon fibre, by contrast, has but few crystalline regions while in a mercerised fibre the closeness of molecular packing is somewhere between that of ordinary cotton and viscose rayon fibres. This difference of molecular structure has an important influence on the manner in which these fibres swell when wet and, in turn, the degree of swelling influences the way in which the applied resin precondensate or formaldehyde can become distributed within the fibres.

It can be anticipated that the effects of a crease-resist treatment must be influenced greatly by such differences of resin distribution. One example of this is that it usually requires about twice as much of a urea-formaldehyde resin in a viscose rayon fibre as is required for a cotton fibre to produce the same degree of crease resistance. Another is that if a small amount of moisture is allowed to be present during the curing of dry resin impregnated cellulose fibre material the lowering of abrasion resistance and tear-strength which often accompanies a resin treatment is reduced. Many such effects of this kind have been observed and this has now led to a re-examination of the influence of moisture in crease-resist processing.

The view has been taken that possibly new observations may reveal facts of possible assistance in the production of wash-and-wear finishes.

A communication by Guthrie (J. Text. Res. 1959, **29**, 836) briefly draws attention to the fact that cotton fabric treated with formaldehyde in the presence of an acid catalyst under conditions such that the fabric is in an aqueous liquor during the whole of the treatment and is not at any time dried or raised above 85°C. combines with up to 0·4% of formaldehyde and at the same time acquires a moderate increase of resistance to dry creasing but a remarkably large increase in its resistance to wet creasing. This is a very interesting indication that by employing aqueous conditions during the cross-linking of the cellulose molecules quite different results can be obtained than by the use of dry or anhydrous conditions. The data in Table 1 were obtained by Guthrie in investigations in which bleached cotton fabrics (with and without pre-mercerisation) were immersed for six hours in a liquor prepared with 300 c.c. of 36% formaldehyde (stabilised with methyl alcohol), 50 c.c. of 90% formic acid, and 200 c.c. of water, and maintained at 80°C. (in the case of another mercerised fabric the liquor contained 0·5 g. of ammonium chloride instead of the formic acid). After such treatment the fabrics were washed and air-dried.

An aqueous hot formaldehyde treatment of cotton fabric (advantageously pre-mercerised) can thus produce a very useful increase in the wet crease resistance as distinct from the dry crease resistance, and it is further to be noted that the treatment does not require temperature conditions exceeding 100°C.

Subsequently Reeves, Perkins and Chance (Amer. Dye. Rep., 1960, **49**, 639) have more fully examined the effect of formaldehyde on cotton in the presence of water sufficient to saturate the fibres—in the laboratory and on the large scale. These workers were encouraged to use formaldehyde rather than a resin or other agent

Table 1

Fabric	Catalyst	Formaldehyde content of treated fabric	Breaking strength of warp	Tear strength of warp	Crease-angle degree (warp + weft) Wet	Dry
Bleached	**Formic acid**	**0·42%**	**44·0 (80·2)**	**1·3 (1·9)**	**248 (168)**	**197 (178)**
Mercerised	**Formic acid**	**0·42%**	**48·5 (78·0)**	**1·2 (1·8)**	**260 (171)**	**168 (151)**
Mercerised	**Ammonium chloride**	**0·24%**	**36·4 (47·6)**	**1·7 (2·4)**	**273 (203)**	**200 (197)**
Fabric bleached and formaldehyde-treated in a jigger at 85°C. for six hours in a liquor prepared with 60 lbs. of 36% formaldehyde, 36 lbs. of water, and 10½ lbs. of 90% formic acid gave the following results:—		**0·18%**	**65·0 (78·8)**	**1·4 (1·7)**	**218 (176)**	**180 (165)**

Note: **the figures in ( ) refer to the untreated fabric.**

because it is cheap and is known to be more effective weight-for-weight than a resin for conferring dry crease resistance. It is true that the treatment of cotton with formaldehyde-acid is generally regarded as being risky from the viewpoint of tendering the fibres but against this Goldthwaite has demonstrated (J. Text. Res., 1951, **21**, 55) that under suitable conditions of treatment the properties of cotton can be much modified (e.g., it may be given a complete resist to direct cotton dyes) without appreciable weakening of the fibres.

In some preliminary studies it was found that by immersing bleached cotton fabric for 30 min. in a liquor at 28°C. consisting of a 19·5% aqueous solution of hydrochloric acid containing 7·4% of formaldehyde, a large increase of wet crease resistance could be obtained with about the same losses of tensile and tear strengths as would be produced in crease-resisting finishing the fabric with dimethylol ethylene-urea or a triazone by commercial methods. At the same time this treatment scarcely changed the dry crease resistence. Afterwards it was found that much the same high resistance to wet creasing accompanied by a reasonable lowering of tear strength could be obtained by padding the fabric with the formaldehyde+HCl solution at room temperature and then allowing the fabric to lie for upwards of one to two hours (on the large scale this period could be obtained by the use of a J-box as used for the continuous hydrogen peroxide bleaching of cotton fabric) and then washing-off. Thus the basis of a commercial process for giving cotton fabric wet crease resistance appears to be established—it depends on the action of a small proportion of formaldehyde catalysed by hydrochloric acid and does not involve a high temperature curing.

A comparison between the wet crease resistances of ordinary bleached and bleached/mercerised cotton fabrics similarly padded with the formaldehyde HCl liquor and then allowed to lie as in a J-box for up to three hours at room temperature was made and the results expressed graphically in Fig. 1. Mercerisation favours a higher wet crease resistance and it would appear that less combined formaldehyde is to be found in the mercerised fabric for any given value of wet crease resistance.

In a large scale experiment 50 yds. of mercerised cotton fabric was given two dips and nips with the formaldehyde HCl liquor in a padding machine and allowed to lie for twenty minutes on a batching roller before being neutralised with dilute sodium carbonate solution and washed in hot and cold water in a jigger. The resulting dry fabric had wet and dry crease resistances indicated by crease angles (in a test) of 301° and 172° (warp weft) respectively; it had reduced tensile and tear strengths and a very low resistance to abrasion. Obviously such a high wet crease resistance is only obtained by a considerable sacrifice of other properties of the cotton fabric yet it is an important fact that a high wet crease resistance is thus obtained. This crease resistance is not accompanied by some other defects common to several resin treatments such as those which use urea- and melamine-formaldehyde resins, dimethylolethyleneurea, and triazones such as weakening and yellowing when treated with hypochlorite liquors as a result of chlorine retention and the formation of objectionable odours when the finished fabric is stored.

The suggestion is made (this arises from the fact that the formaldehyde treated fabric does not acquire an appreciable increase of dry crease resistance) that it might be useful to give a somewhat weak formaldehyde HCl treatment to secure a desirable degree of wet crease resistence and then after-treat with only about one-half of the usual amount of resin to obtain the required increase of dry crease resistance.

Use of Epoxides in Treatments

It has recently been shown by Schroeder and Condo (J. Text. Res., 1957, **27**, 135) that epoxy resins can be applied to cotton and rayon materials to give a satisfactory degree of dry crease resistance and since then the Shell Chemical Corp. have made available an increasing range of epoxy compounds for this and other processes. Two important facts were established. By use of such resins cellulose fibre materials could be given a wash-and-wear finish having a very high degree of resistance to washing (with some resin finishes the resin is gradually removed by repeating washing) and the finished fabric has no chlorine-retentive properties so that it satisfactorily withstands whitening treatments which involve a light bleaching with a hypochlorite liquor.

Unfortunately it is at present somewhat costly to finish textile goods with epoxy resins. From this latter viewpoint Gagliardi and Shippee (J. Text. Res., 1959, **29**, 54) investigated the possibility of cheapening the processing by using mixtures of epoxy with other commonly used and cheaper resins.

The epoxy resins are the type shown in Fig. 2, where *R* can be a carbon chain interrupted by oxygen atoms and when suitably applied to cellulose fibre materials it effects a crosslinking of the cellulose molecules in the following stages in the first of which the epoxy compound adds on water while

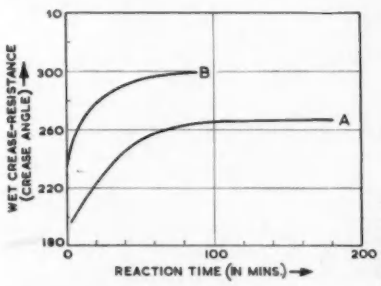

Fig. 1. Curves showing the wet crease-resistances of (A) bleached and (B) bleached and mercerised cotton fabric padded with a formaldehyde + HCl liquor and allowed to lie for three hours at room temperature

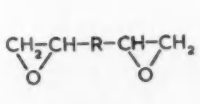

Fig. 2

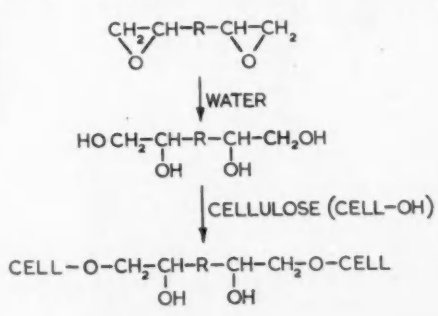

Fig. 3

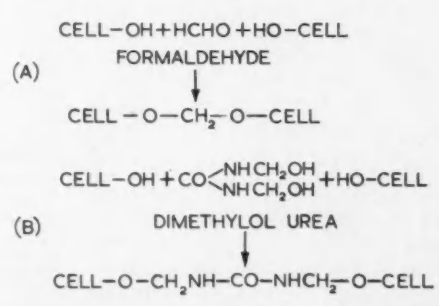

Fig. 4

in the second it condenses with the hydroxyl group of the cellulose molecules (Fig. 3). For comparison the cross-linking of cellulose by formaldehyde (A) and by dimethylolurea (B) is shown in Fig. 4.

It is to be observed that with formaldehyde the methylene—CH_2—cross-link is short and of very low molecular weight. The cross-link is somewhat more complex when obtained with dimethylolurea (say molecular weight of 146) but is definitely much more complex with the epoxy compound (an average molecular weight of 350 may be assumed). Thus to effect the same proportion of cross-linking of the cellulose molecules in a cotton fibre it will be necessary to use at least twice the weight of epoxy compounds as of the dimethylolurea; this explains partly why it can be so much more costly to use the latter type of cross-linking agent. For the same reason it will be preferable to use the simplest of epoxy compounds with their corresponding lower molecular weights and although the diglycidyl ether of glycerine has been proposed for giving cellulose fibre materials crease-resist and wash-and-wear characteristics there are good reasons why the vinyl-cyclo-hexene dioxide having the typical epoxy structure shown in the formula Fig. 5 should be used. It is now available as UCET Textile Finish 11-74 (Union Carbide Corporation).

In studying mixtures of epoxy resins with other resins used in crease-resist finishing Gagliardi and Shippee found that in securing the finish with 10% of resin mixture the highest dry crease-resistance was obtained with mixtures containing the nitrogen-containing dimethylolethylene urea rather than with methylated urea-formaldehyde or methylated melamine-formaldehyde resins (also nitrogen-containing) and this is shown clearly by the curves in Fig. 6 which show the crease resistances obtained using different proportions of the ingredients. It is true that all of these other resins are chlorine-retentive to some degree because of their nitrogen content but with a mixture not exceeding three parts of either of these resins with seven parts of the epoxy resin a very satisfactory highly crease-resistant wash-and-wear finish can be obtained which is non-chlorine retentive and comparable in cost to other resin treatments while, at the same time, being very durable throughout repeated washing.

More recently Galligan, Sookne, and others (J. Text. Res., 1960, **30**, 209) have reported new developments in

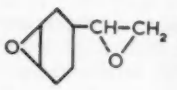

Fig.

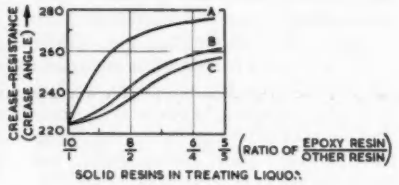

Fig. 6. Curves showing the crease-resistances of cotton fabrics finished with mixtures of epoxy and (A) dimethylol ethylene urea, (B) methylated polyurea-formaldehyde and (C) methylated trimethylol melamine resins

epoxy resin wash-and-wear finishes for cotton fabrics with reference to some of the newer epoxy resins now commercially available. The results of Gagliardi and Shippee concerning the high value of epoxy resins in wash-and-wear finishing have been confirmed and in particular it has been established that such finishes are remarkably stable to acid treatments which reduce to almost zero the crease-resistance due to several commercial nitrogen-containing resins. The data in Table 2 obtained in some comparative trials in which variously finished cotton fabrics were treated with (1) 1·3% phosphoric acid solution containing 5% of urea for five minutes at 77°C. and (2) 0·1 N. hydrochloric acid solution at 80°C. for 25 min., followed by a determination of the lowering of crease-resistance which arises from the loss of resin in such acid treatment.

Table 2

Resin present in fabric	Crease-resistance of fabric After acid treatment with		
	Initial	H_3PO_4 + urea	HCl
Dimethylolethylene urea	78	47	44
Triazone type	74	46	44
Triazine type	74	52	48
Modified melamine-formaldehyde ..	72	53	53
Dimethylol hexahydro-pyrimidone ..	76	48	47
Epoxide IV (vinyl-cyclo-hexene dioide) ..	66	69	68
Another commercial Epoxide resin ..	72	69	67

Since acid treatments may be involved in laundering processing this higher stability towards acid liquors must be considered as being an important advantage for wash-and-wear fabrics finished with epoxy resins. Readers wishing to experiment in this direction should note that Galligan, Sookne, and their collaborators consider the most useful epoxy compound now available for textile treatment is Epoxide IV (vinyl-cyclo-hexene dioxide). It gives good results by itself and also in resin mixtures with nitrogen-containing resins. It is not chlorine-retentive and the finish obtained is notably fast to acid treatments. Epoxide IV is water-soluble and in producing any given degree of crease-resistance it does so with a lower loss of tensile strength than do other epoxides. The finished cotton fabric is resistant to discoloration during heating to a high temperature.

Recently American research has resulted in the discovery (U.S.P. 2,904, 387) that a number of reaction products of formaldehyde with dihydrazides of formula $R(CONH.NH_2)_2$ in which R stands for an alkylene group $(—CH_2—)n$ in which n is 0 to 5, are especially satisfactory for the production of crease-resistant cellulose fibre materials also having wash-and-wear characteristics. The results obtained depend on the molecular weight of the monomeric dihydrazide. that is R in the above formula, and it is found that dihydrazides containing alkylene groups having more than five carbon atoms produce reaction products which are inferior in respect of their crease-proofing properties.

In general these new crease-proofing agents are made by reacting an excess of formaldehyde with the dihydrazide in aqueous solution at 10 to 50°C. and under slightly acid to alkaline conditions (pH 6 to 11). They are water-soluble and in many cases can be used for treating textile materials directly as prepared, but a superior crease-resist finish can be obtained if the aqueous solution is allowed to stand for up to 24 hours since a certain small degree of polymerisation then takes place but not sufficient to produce molecules too large to penetrate the interior of the fibres. The following is a typical method for preparing the liquor used for impregnating cotton fabric.

Firstly 1·62 moles of formaldehyde (in the form of a 37% aqueous solution) are mixed with 0·27 moles of adipic acid dihydrazide, having the formula shown in Fig. 7., and 1170 c.c.

$$NH_2NHOCCH_2CH_2CH_2CH_2CONH.NH_2$$

Fig. 7

of water with the pH of the mixture being maintained at 9·5 by slow addition of 10% caustic soda solution. The mixture is stirred at room temperature for one-half hour. Then 4 g. of magnesium chloride hexahydrate are added and the pH of the mixture drops to pH 8·7.

In a trial, samples of cotton fabric were padded with the above liquor, whose essential ingredient is the dimethylol derivative of the adipic acid dihydrazide with the formula in Fig. 8 so as to have a liquor pick-up of 110%. These were then dried on a hot cylinder for 4 min. at 200°F. and further cured for 4 min. at 325°F. and after conditioning were tested with the results set out in Table 3. The low loss of tensile strength coupled with a good increase of crease-resistance is to be noted. The data in Table 4 were obtained by similar treatments various dihydrazide-formaldehyde agents to show how the results compare with the use of the commercial crease-resist compound, cyclic ethyleneurea formaldehyde having the formula shown in Fig. 9.

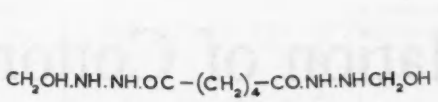

Fig. 8

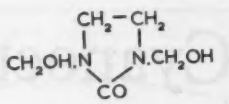

Fig. 9

Table 3

Sample	Pick-up of solids by fabric	Crease-angle	Loss of tear strength	Loss of tensile strength
No. 1	5·0%	105°	22%	4·5%
No. 2	4·8%	110°	20%	5·4%
No. 3	5·8%	109°	23%	6·7%
Untreated		75°		

Note:—**Maximum possible crease-angle is 180°.**

It has already been mentioned that the chlorine-retentivity of a wash-and-wear fabric produced with the aid of a crease-resist processing is important because if this particular finish causes the fabric to retain active chlorine in a whitening treatment which uses a hypochlorite bleaching liquor then it is possible that during storage and especially during subsequent hot ironing with moisture present the fabric will become yellow and suffer a considerable loss of strength. If the ironing is effected very hot then the fabric may become brown by scorching more easily at a lower temperature than with untreated cotton fabric. It is especially advantageous if the crease-resist process is effected with a non-nitrogenous resin since those resins which contains nitrogen such as urea- and melamine-formaldehyde resins pick-up and usually retain chlorine very tenaciously. It is remarkable that although these new dihydrazide-formaldehyde compounds contain a high proportion of nitrogen they confer only small chlorine retentive properties on the cellulose fibre materials treated so that only a relatively small degradation of the treated cotton fabric occurs during storage and hot ironing.

Experience with crease-resist finishing using the dihydrazide-formaldehyde compounds described above has shown that, whereas cotton fabric made crease-resistant with the aid of cyclic ethyleneurea-formaldehyde behaves in a standard method of testing so as to lose 75% in tensile strength and discolours to a greenish yellow, the same fabric made crease-resistant using adipic acid dihydrazide-formaldehyde does not become discoloured and loses only 13% of its strength. Further, it is generally found in the same test that many fabrics made crease-resistant on the large scale with nitrogen-containing agents lose 50 to 90% of their tensile strength.

Table 4

Crease-resist agent	Dry solids pick-up by fabric	Crease-angle	Tensile strength loss	Tear strength loss
Untreated		76°		
Cyclic ethyleneurea + formaldehyde	10%	120°	40%	38%
Adipic acid dihydrazide + formaldehyde	5·5%	108°	7·3%	26%
Succinic acid dihydrazide + formaldehyde	10%	117°	16%	34%
Glutaric acid dihydrazide + formaldehyde	10%	126°	14%	41%

The test used in obtaining the above data is one proposed by A.A.T.C.C. and in it the fabric under test is first soaked in a dilute solution of sodium hypochlorite corresponding to a normally employed bleaching liquor and is then mangled, dried, and given a standard scorching exposure between two electrically heated metal plates pressed together under a standard pressure and maintained at a standard temperature.

At present hydrazine (used in the preparation of the hydrazide described above) is being manufactured on a large scale and recently several new manufacturing plants have been erected so that it is no longer the expensive chemical it formerly was. The production of wash-and-wear cotton materials in America is now of exceptional interest and is very rapidly increasing.

It is predicted that in the near future all but a small portion of the 5½ billion yards of woven goods for household and garment use will be resin finished. In all this progress only one snag has been encountered. It is that during storage of resin-finished goods there is a risk of slow liberation of formaldehyde from them and to a degree which can cause odour problems in large stores both to the store personnel and to customers. Such complaints have led to investigations being carried out by Reid, Arcenuaux, Reinhardt, and Harris (Amer. Dye. Rep., 1960, **49**, 490) in the Southern Regional Research Laboratory of the U.S. Dept. of Agriculture, a Department engaged in promoting the greater use of cotton.

Investigations so far carried out indicate that formaldehyde liberation is much greater when the resin-finished fabric has not been efficiently washed after the usual high temperature curing stage. The fabric then contains residual acid, catalyst and the resin, and it is known that the formation of the resin is a reversible process. Thus in the formation of the resin, say from urea and formaldehyde, these two substances unite under acid conditions, aided by the catalyst. But if the conditions are suitable then the resin can decompose with formation of the original ingredients urea and formaldehyde. Storage conditions are favourable to this reversed action if the resin-finished fabric has not been thoroughly washed free from acid and catalyst. It is therefore most strongly emphasised that the final washing of a resin-finished material must be thorough if storage liberation of objectionable formaldehyde vapours are to be avoided. The manner in which formaldehyde is liberated from

(*continued on page* 503)

Cyanoethylation of Cotton in Aqueous Medium

As a result of further work carried out with the aim of improving the process, the authors conclude that the cyanoethylation of cotton in aqueous medium proceeds at a substantially slower rate than in conventional processes, and the maximum degree of cyanoethylation obtainable falls far short of full cyanoethylation

By N. M. BIKALES and L. RAPOPORT*

As a result of Compton's finding (3) of the improved properties of partially cyanoethylated cotton, notably complete rotproofness, a considerable effort has been made to develop practical procedures for the treatment. Compton's original two-step process has been modified by systematic investigation of the variables (2, 4, 6, 12, 19), by dilution of acrylonitrile with an organic solvent (2, 6), by the use of swelling salts to accelerate selectively the cellulose-acrylonitrile reaction (1), and by elimination of the alkali pretreatment step of the process (5, 10). Other variations included reaction in the vapor phase (4, 5) or in a molten metal bath (4, 11). The primary aim of these improved processes was to reduce the amount of acrylonitrile. lost in the side reaction with water to form $\beta_1 \beta^1$-oxydipropionitrile. In the original two-step process, these losses amounted to at least five times as much as the quantity of acrylonitrile actually combining with the cellulose. The latter processes brought this amount to about equal weights being lost and reacting, or even less in some cases.

The authors now wish to report further work carried out with the aim of improving the cyanoethylation process. The present approach, in contrast to the earlier procedures, utilizes only small quantities of acrylonitrile dissolved (or dispersed) in aqueous sodium hydroxide solutions. It was hoped that this process would not only reduce losses, but also eliminate the recovery of unreacted acrylonitrile which is necessary in conventional processes. A somewhat similar procedure had been used in the classical studies of MacGregor with solutions of cellulose xanthate (13, 14) and by Miller and Flowers in the cyanoethylation of lignocellulose (16). After the completion of this investigation, a report appeared describing the reaction of acrylonitrile with cellulose in aqueous medium to give carboxyethylcellulose (20).

Procedure

A typical procedure of cyanoethylation in aqueous medium was as follows:

A 10 g. skein of 40/2 greige yarn (Standard-Coosa-Thatcher Co.) was added to a stoppered 500 ml. flask equipped with mechanical stirrer and containing 200 g. of a 10% aqueous sodium hydroxide solution. The temperature was maintained at 15 - 20°C. After the cotton was thoroughly impregnated with the alkaline solution, 6·4 g. of acrylonitrile (AN) was added, and reaction was allowed to proceed for 4 hr. The mixture was then neutralized, and the cotton was washed, dried, and analysed for nitrogen content. Since there was virtually no remaining acrylonitrile, the efficiency of the reaction could be determined directly from the percent nitrogen and the weight of the cotton. The efficiency was expressed by an AN ratio defined as follows:—

$$\text{AN ratio} = \frac{\text{weight of AN not reacted with cotton}}{\text{weight of AN reacted with cotton}}$$

The numerator corresponds to the difference between the quantity of acrylonitrile initially added and the denominator of the ratio. A low AN ratio, therefore, is indicative of an efficient reaction. In the experiment described above, the average nitrogen content of the cotton was found to be 3·6%, and the AN ratio was 3·5. Under the same conditions, but using lignocellulose, Miller and Flowers obtained 2·5% N. (16); the AN ratio, when calculated as above, was 5·1.

Effect of Variables on the Reaction

A systematic study of variables was undertaken with the hope of finding conditions giving the desired degree of cyanoethylation (3 - 4% N.) with minimum losses of acrylonitrile in side reactions. A practical difficulty in this system was that usually several variables were affected per single change in the proportions of reactants.

Ratio of Sodium Hydroxide Solution to Cotton

Experiments were carried out under the same conditions as described above but with varying weights of sodium hydroxide solution (50 - 200 g.). The results, shown in Fig. 1, indicate the degree of cyanoethylation to be inversely proportional and the AN ratio to be directly proportional to the sodium hydroxide solution: cotton ratio. At a ratio of 5, the caustic solution was completely soaked up by the cotton, but the efficiency of the reaction was nevertheless better than with the larger volumes of solution. The AN ratios found here are considerably more favorable than those obtained with the use of the standard two-step procedure (4). Fig. 1 can also be considered as a plot of the degree of cyanoethylation as a function of the acrylonitrile concentration, at a constant acrylonitrile: cotton ratio. The ratio of sodium hydroxide to cotton was, of course, also affected in these experiments.

Amount of Acrylonitrile

The general procedure was repeated, but at a constant sodium hydroxide solution: cotton ratio of 10, and with varying amounts of acrylonitrile. Fig. 2 shows a linear relationship between the degree of

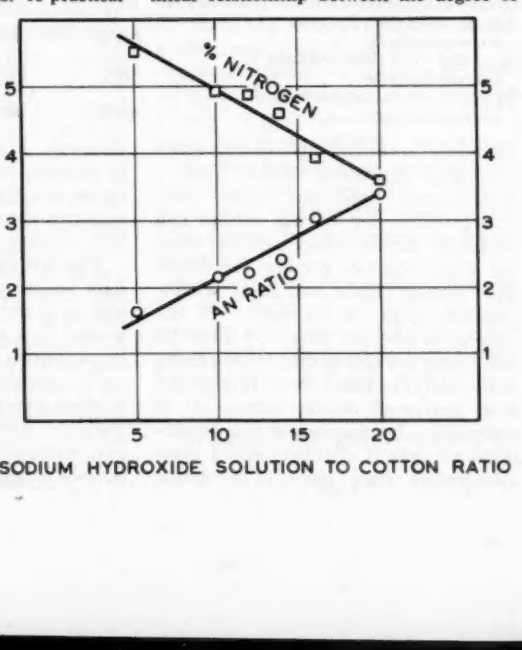

Fig. 1. Effect of the sodium hydroxide: cotton ratio on the percentage nitrogen and the AN ratio (10 g. of cotton; 10% NaOH; 6·4 g. of AN; 4 hours at 15—20°C)

* *Stamford Laboratories, Research Division, American Cyanamid Company, Stamford, Connecticut.*

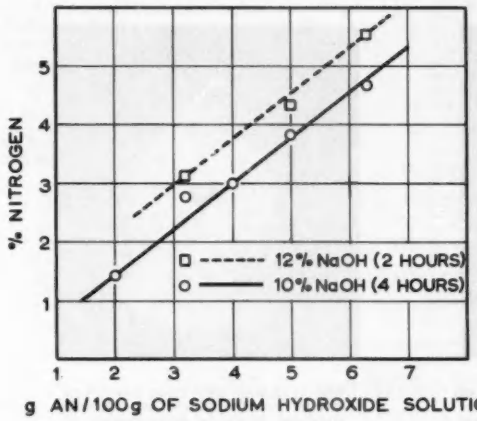

Fig. 2 (left). Effect of the amount of acrylonitrile used on the percent nitrogen (10 g. of cotton; 100 g. of NaOH solution; 15—20°C)

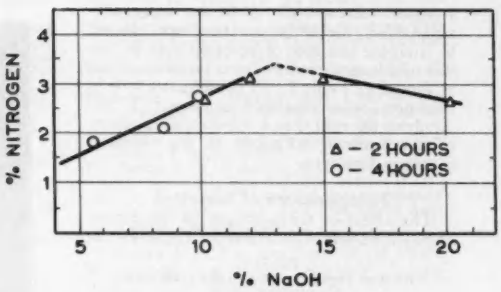

Fig. 3 (right). Effect of the sodium hydroxide concentration on the percent nitrogen (10 g. of cotton; 100 g. of NaOH solution; 3·2 g. of AN; 15—20°C)

cyanoethylation and the amount of acrylonitrile added. The AN ratio was calculated to be virtually constant in these runs, varying from 1·9 to 2·2. Similar results were obtained with 12% sodium hydroxide, but the percent nitrogen obtained was higher at comparable acrylonitrile levels (Fig. 2) and the AN ratio was therefore lower (1·5 - 1·8). A reaction time of only 2 hrs. was used in order to minimise hydrolysis (6).

Fig. 2 is a plot of the percent nitrogen as a function not only of the acrylonitrile concentration but also of the acrylonitrile: cotton ratio. The latter variable was studied by the experiments shown in Table 1. In these runs, the acrylonitrile

Table 1
Effect of the Acrylonitrile:Cotton Ratio*

Cotton, g.	AN: cotton ratio	Sodium hydroxide solution: cotton ratio	% Nitrogen
3·2	1·0	31	4·7
5·0	0·64	20	3·5
10·0	0·32	10	2·8

* Conditions: 3·2 g. of acrylonitrile, 100 g. of 10% sodium hydroxide solution; 4 hrs. at 15 - 20°C.

concentration was kept constant, but the acrylonitrile: cotton ratio was changed which, of course, also affected the solution: cotton ratio. The highest nitrogen content was obtained at the highest acrylonitrile: cotton ratio, in spite of the fact that the simultaneous change in the sodium hydroxide solution: cotton ratio must have tended to counteract this effect (Fig. 1). Thus, both the acrylonitrile concentration and the acrylonitrile: cotton ratio are important variables.

Sodium Hydroxide Concentration

A series of runs was made at 15 - 20°C., with a sodium hydroxide solution: cotton ratio of 10 and 3·2 g. of acrylonitrile per 100 g. of alkaline solution. The concentrations of sodium hydroxide were varied from 5·7 to 20% (Fig. 3). The time of reaction was 4 hrs. for runs with concentrations of up to 10% and 2 hrs. with the more concentrated solutions. It is apparent that increasing the sodium hydroxide concentration up to about 13% resulted in higher degrees of cyanoethylation. The nitrogen content decreased, however, when the alkali concentration exceeded this value. In these experiments, the ratio of sodium hydroxide to cellulose, which is probably also a significant variable (9, 19), changed with concentration.

An experiment was made combining the optimum sodium hydroxide solution: cotton ratio, 5, with the optimum alkali concentration, or 12%. After 2 hrs. at 15 - 20°C., using 3·2 g. of acrylonitrile per 10 g. of cotton, the product contained 3·6% nitrogen. The AN ratio in this experiment was only 1·1. The maximum cyanoethylation found with the use of about 13% sodium hydroxide can be correlated with the maximum swelling of cellulose known to occur at the same concentration (15). Grant and co-workers have observed a similar maximum at approximately this concentration in the conventional two-step procedure (9).

Use of Additives

It has previously been reported that salts with ability to swell cellulose, such as sodium thiocyanate, increase the rate of cyanoethylation in procedures where a relatively large excess of acrylonitrile is used (1). In aqueous medium, however, an increase in the degree of cyanoethylation was noted with these salts in only a few cases. Furthermore, the combined swelling action of the alkali and the salt rendered the cotton slick and gelatinous, making this approach unsatisfactory.

In contrast, sodium chloride, which is ineffective in procedures using a large excess of acrylonitrile (1), proved valuable in the aqueous procedure. This is illustrated in Fig. 4. The conditions studied were: 10 g. of cotton, 4·0 g. of acrylonitrile; 15 - 20°C. composition of aqueous solution; 10 g. of sodium hydroxide; 10 g. of sodium chloride and 80 g. of water. A control was also run, in which the salt was replaced by 10 g. of water. Fig. 4 shows that the salt had no significant effect on the rate of reaction (up to 2 hrs.), but that with it reaction continued for a longer time. The maximum nitrogen content obtained with the salt was 4·2% vs. 3·0% for the control; the AN ratio were 1·1 and 2·1, respectively. The effect of sodium chloride concentration is seen in Table 2.

Table 2
Effect of Sodium Chloride Concentration*

Water, g.	Sodium chloride, g.	% Nitrogen	AN ratio
90	—	3·0	2·1
85	5	3·6	1·5
80	10	4·2	1·1
75	15	4·3	1·0

* Conditions: 10 g. of cotton; 4·0 g. of acrylonitrile; 10 g. of sodium hydroxide; 4 hrs. at 15 - 20°C.

A concentration of about 10% appears to be optimum. Thus, sodium chloride only extends the length of time during which acrylonitrile is available for reaction. This suggests that it "protects" the acrylonitrile from side reactions, possibly by salting it out from solution, while the relatively slow cyanoethylation of cotton proceeds. The ineffectiveness of swelling salts in this procedure is not surprising, since swelling would not be expected to be significantly increased by them beyond the state achieved by the high alkali concentrations used.

Time of Reaction

The effect of time under typical conditions is seen in Fig. 4. Without salt, the reaction was essentially complete in 2 hrs. In some runs, however, a slight increase in nitrogen content (0·2%) was observed after an additional 2 hrs., at which time all acrylonitrile had disappeared. Since attempts to shorten

Table 3
Use of Excess Acrylonitrile*

Acrylonitrile, g.	Time min.	% Nitrogen
6·4	60	3·2
6·4	110	4·1
8·0	60	4·0

* Conditions: 10 g. of cotton; 100 g. of 10% sodium hydroxide solution; 15 - 20°C.; acrylonitrile was not completely soluble in reaction mixture.

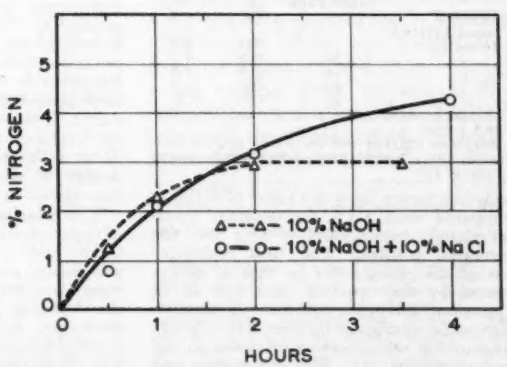

Fig. 4. Effect of sodium chloride on the rate of cyanoethylation (10 g. of cotton; 10 g. of NaOH; 10 g. of NaCl and 80 g. of water; 4·0 g. of AN; 15—20°C)

reaction times with additives were unsuccessful, the only practical way found to increase the rate of reaction was by the use of a larger excess of acrylonitrile. This is shown in Table 3. In these runs, 3 - 4% nitrogen was reached in about 1 hr. Analysis showed that a substantial quantity of acrylonitrile remained in the reaction mixture, however.

Temperature of Reaction

The effect of temperature on the extent of reaction was investigated (Table 4). It

Table 4
Effect of Temperature on the Degree of Cyanoethylation*

Water g.	Sodium hydroxide, g.	Time hr.	Temperature, °C.	Nitrogen, %
88·0	12·0	2	15 - 20	3·1
88·0	12·0	2	35	0·6
90·0	10·0	2	8 - 10	1·9
90·0	10·0	2	15 - 20	2·7
90·0	10·0	4	room	1·4
90·0	10·0	2	35	0·7
91·5	8·5	4	15 - 20	2·1
91·5	8·5	2	room	1·4
91·5	8·5	2	35	0·8
94·5	5·5	2	35	0·9
94·5	5·5	1	35	1·1
98·0	2·0	2	35	0·7

* Conditions: 10 g. of cotton; 3·2 g. of acrylonitrile.

was found that lower degrees of cyanoethylation resulted when temperatures either lower or higher than 15 - 20°C. were used. At 35°C., with a sodium hydroxide solution: cotton ratio of 10 and an acrylonitrile: cotton ratio of 0·32, it was not possible to exceed 1·1% nitrogen when the alkali concentration was varied from 2 to 12%. These experiments indicate that the temperature range initally chosen (15 - 20°C.) on the basis of prior work (16) was the optimum for cyanoethylation in aqueous medium, and that the elimination reaction (cleavage of cyanoethyl groups) is strongly temperature-dependent (6, 13, 14).

Physical Properties

It became apparent very early in this work that the physical properties of cotton cyanoethylated in aqueous medium were significantly different from those of cotton treated by the conventional methods. In general, the cotton of this process appeared to be more highly swollen and to have less luster; in some cases, it became gelatinous on contact with water and harsh when completely dry. The tensile strength was lower than that of ordinary cyanoethylated cotton, but the elongation was significantly higher (Table 5). A determination of

Table 5
Physical Properties of Cotton Cyanoethylated in Aqueous Medium*

Sample	Sodium hydroxide solution: cotton ratio	Tensile strength, g.	Elongation, %
Untreated ..	—	585	4·2
Cyanoethylated, two-step ..	—	795	5·5
A†	20	425	9·5
B†	14	610	8·0
C†	12	655	11·5
D†	10	720	11·0

* Measurements made at 21°C. and 65% RH; 40/2 yarn.
† Reaction carried out for 4 hrs. at 15 - 20°C. with 10% NaOH and acrylonitrile:cotton ratio of 1:3.

moisture regain showed a value of 6·7% as compared with 5·4% for ordinary cyanoethylated cotton and 7·8% for the untreated control. The heat resistance was of the same order as that of cotton treated by the two-step procedure to an equivalent nitrogen content. A product with some similar properties was recently obtained by mercerisation of cotton in the slack condition (8). The appearance and

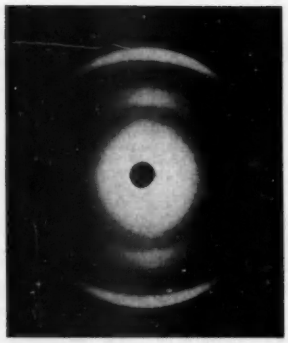

Fig. 5. X-ray diffraction pattern of cotton cyanoethylated by the two-step procedure; identical with that of native cellulose

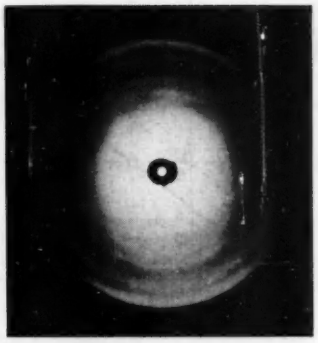

Fig. 6. X-ray diffraction pattern of cotton cyanoethylated in aqueous medium, showing deterioration of the cellulose

tensile strength improved when the ratio of sodium hydroxide solution to cotton was decreased (Table 5). It was also observed in a qualitative way that the appearance and hand were improved by the use of higher temperatures or lower alkali concentrations, i.e., by conditions which minimised swelling.

The most striking difference, however, was in the resistance of the cotton to microbiological degradation. Whereas cotton cyanoethylated by the conventional processes suffers no loss in tensile strength upon prolonged soil burial, provided that it contains at least 3% nitrogen (3), cotton cyanoethylated in aqueous medium lost most of its strength or disintegrated completely within two weeks, even though it was cyanoethylated to as much as 5·5% nitrogen. Carrying out the reaction under an atmosphere of nitrogen to prevent oxycellulose formation did not improve the properties of the cotton.

In an effort to account for these differences in microbiological resistance, X-ray diffraction patterns were obtained. A considerable degree of deorientation was noted in samples which had been cyanoethylated in aqueous medium, whereas no significant change from untreated cotton was observed in products cyanoethylated by conventional methods, thus providing a correlation with rot resistance This is shown in Figs. 5 and 6. Deorientation and decrystallisation are known to affect adversely the microbiological resistance of cellulose (17, 18).

An indication that deorientation or similar effects caused solely by the strong alkali were not the only factors to be considered was obtained by subjecting cotton to the action of 10% sodium hydroxide for 4 hrs. at 15 - 20°C. After neutralisation and washing, the cotton was immediately cyanoethylated by the two-step procedure to a nitrogen content of 4·2%. This sample lost no strength upon six weeks of soil burial, even though the X-ray diffraction pattern indicated a slight degree of deorientation (but much less than shown in Fig. 6).

The possibility that partial hydrolysis of cyanoethyl groups may have contributed to the lack of micro-biological resistance was also investigated. Carboxyethyl determinations showed that cotton treated by the aqueous procedure generally had a somewhat higher acid content, about 0·03 - 0·05 meq/g., as compared with 0·02 - 0·03 meq/g. for cotton treated by the conventional two-step procedure. As it has been reported that the presence of relatively large amounts of carboxyethyl groups results in poor performance in the soil burial test because of intense swelling (19), it is probable that this factor also was important here. Further evidence for hydrolysis was the faint odour of ammonia noticeable during reaction. Hydrolysis of acrylonitrile could, of course, have contributed to this effect, but it was noted that at least in some instances a portion of the cotton actually dissolved in the alkali, indicating that cyanoethyl groups chemically combined with cellulose had been subjected to hydrolysis.

Differential dyeing of cotton cyanoethylated in aqueous medium to a nitrogen content of 3·8% gave a blue-purple colour instead of the red usually found (7). The uniformity appeared to be satisfactory. The use of a large excess of acrylonitrile (two parts per part of cotton) to overcome any possible nonuniformity gave a product which still had a blue colour on differential dyeing and disintegrated in the soil burial test. X-ray examination showed a considerable degree of deorientation. It is likely, therefore, that the poor microbiological resistance is not primarily the result of nonuniformity of cyanoethylation, but that deorientation and hydrolysis may be important factors.

Conclusions

The cyanoethylation of cotton in aqueous medium proceeds at a substantially slower rate than in conventional processes, and the maximum degree of cyanoethylation obtainable falls far short of full cyanoethylation. Under optimum conditions, i.e., at 15 - 20°C., using a sodium hydroxide solution: cotton ratio of 10 or less, an alkali concentration of 10 - 12%, and an additive, such as sodium chloride, the amount of acrylonitrile lost in side reactions is roughly equal to the amount of acrylonitrile that reacts with the cotton. This is considerably better than in the conventional two-step process; but equally satisfactory or better results have been obtained in other recently developed procedures (1, 2, 5, 10, 11).

The physical properties of cotton cyanoethylated in the slack condition by the procedure of this report reflect the drastic conditions of treatment to which the yarn was subjected. All samples were notably deficient in the most important characteristic of ordinary cyanoethylated

cotton, namely microbiological resistance. Probable factors in this deficiency are deorientation of the cellulose and partial hydrolysis of cyanoethyl groups.

Acknowledgments

The authors wish to acknowledge the contributions of A. H. Gruber, Ann L. Hayford, G. Lamb, Dorothy H. Patt, L. R. Pritchard, and Bereit A. Wilcox.

Literature Cited

(1) Bikales, N. M., Gruber, A. H., and Rapoport, L., Ind. Eng. Chem. 50, 87 (1958).
(2) Bikales, N. M. and Gruber, A. H., unpublished work.
(3) Compton, J., Martin, W. H., Word, B. H., Jr., and Thompson, D. D., Tex. Ind. 117, 138A (1953).
(4) Compton, J., Martin, W. H., Word, B. H., Jr., and Barber, R. P., Tex. Res. Jour. 26, 47 (1956).
(5) "Cyanoethylation of Cotton", A Joint Report by Institute of Textile Technology, American Cyanamid Company, and Monsanto Chemical Co., (Sept. 1956); also Am. Tex. Reptr. 71, No. 1, 8 (1957).
(6) Daul, G. C., Reinhardt, R. M., and Reid, J. D., Tex. Res. Jour. 25, 246 (1955).
(7) Fordemwalt, F. and Kourtz, R. E., Tex. Res. Jour. 25, 84 (1955).
(8) Goldthwait, C. F. and Murphy, A. L., Tex. Res. Jour. 25, 47 (1955).
(9) Grant, J. N., Greathouse, L. H., Reid, J. D., and Weaver, J. W., Tex. Res. Jour. 25, 76 (1955).
(10) Gruber, A. H. and Bikales, N. M., Tex. Res. Jour. 26, 67 (1956).
(11) Janssen, H. J., DuPre, A. M., Haydel, C. H., Seal, J. F., and Vix, H. L. E., Ind. Eng. Chem. 50, 76 (1958).
(12) Klein, E., Weaver, J. W., Webre, B. G., and Jurgens, J. F., Tex. Res. Jour. 27, 50 (1957).
(13) MacGregor, J. H. and Pugh, C., Proc. XIth Intern. Congr. Pure & Appl. Chem. (London 5, 123-31 (1947); Publ. 1953.
(14) MacGregor, J. H., J. Soc. Dyers Col. 67 No, 2. 66 (1951).
(15) Mark, H., "Physik und Chemie der Cellulose", Berlin, Julius Springer, 209-228 (1932).
(16) Miller, H. F. and Flowers, R. G., U.S. Patent 2,535,690 (1950).
(17) Perlin, A. S., Michaelis, M., and McFarlane W. D., Can. J. Res. 25C, 246 (1957).
(18) Siu, R. G. H., "Microbial Decomposition of Cellulose", New York, Reinhold Publishing, 256-259 (1951).
(19) Weaver, J. W., Klein, E., Webre, B. G., and DuPre, E. F., Tex. Res. Jour. 26, 518 (1956).
(20) Yashunskaya, A. G., Rogovin, Z. A., and Berlin, A. A., Zhur. Priklad. Khim. 29, 105 (1956).

Wash and Wear Finish

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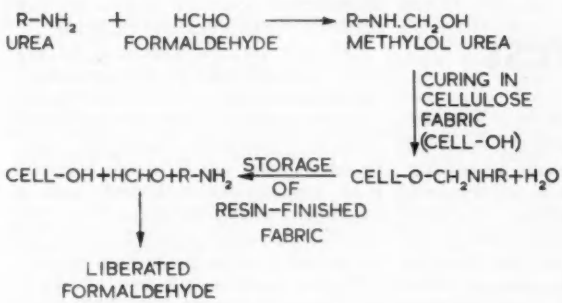


Fig. 10. Manner in which formaldehyde is liberated from an aminoplast resin

an aminoplast resin is indicated in Fig. 10.

The liberation of formaldehyde during storage at room temperature is fairly slow so that for an accelerated testing of the amount of formaldehyde which might be expected to come from a particular resin-finished fabric it is recommended to store an 8 gram sample of fabric within a sealed glass jar also containing 10 c.c. of water for a period of sixteen hours at 80°C. within an oven. Thereafter the formaldehyde present is determined colourimetrically.

Table 5

Finishing agent	Parts of formaldehyde per million parts of fabric Fabric *not* washed after curing stage Catalyst			
	Zinc nitrate	Magnesium chloride	An organic amine chloride	Average
Urea-formaldehyde ..	3,790	5,240	3,730	4,253
Dimethylol cyclic ethylene urea	7,360	6,170	5,270	6,266
Dimethylol ethyltriazone	4,970	4,440	3,560	4,333
Dimethylol hexahydro-pyrimidinone	6,290	5,930	5,170	5,796
Methylated trimethylol-melamine..	4,170	3,660	3,870	3,900
Average	5,316	5,088	4,320	4,908

Table 6

Finishing treatment	Parts of formaldehyde per million parts of fabric Fabric washed after curing stage Catalyst			
	Zinc nitrate	Magnesium chloride	An organic amine chloride	Average
Urea-formaldehyde ..	3,090	5,100	2,100	3,430
Dimethylol cyclic ethyleneurea	2,620	1,120	1,580	1,773
Dimethylol ethyl triazone	1,720	1,390	1,620	1,577
Dimethylol hexahydro-pyrimidinone	2,460	1,320	2,290	2,023
Methlated trimethylol-melamine..	2,730	1,270	2,320	2,106
Average	2,524	2,040	1,982	2,182

By means of such an accelerated test it was shown that the amount of formaldehyde liberated varied with the type of resin applied and also with the catalyst used. In general about two to three times as much formaldehyde was found absorbed in the water within the storage jar as in the washings of the fabric. The data in Tables 5 and 6 gives a clear idea of how much formaldehyde might be expected to be liberated from various types of resin-finished fabrics with and without a final wash in the finishing treatment.

The above data shows that the amount of formaldehyde liberated from an unwashed fabric can be three to four times higher than with a washed fabric, and that more formaldehyde may be expected to be liberated from a fabric resin-finished with the aid of a zinc nitrate catalyst. In general, the formaldehyde liberated from washed fabric corresponds to the methylol content of the resin applied to the fabric.

It is important to note that the liberation of formaldehyde from resin-finished fabrics during storage is much greater as the temperature conditions are higher. This is true for all types of resins. The time of storage, as would be expected, affects the amount of formaldehyde liberated but from typical curves as shown in Fig. 3, it is seen that the rate of liberation is most rapid at the commencement of storage. An interesting experiment in which a resin-treated fabric was washed free from used catalyst and then impregnated with a fresh amount of the catalyst showed that this addition increased the liberation of formaldehyde. It is obvious that this aspect of wash-and-wear resin-treated cotton fabrics is an important one and requires further study.

Shawa and Green Ltd. Private. Reg. Sept. 29. Capital £5,000. Manufacturers and dealers in textiles. J. J. Green, R. S. A. Shawa. Registered office: 109 Portland Street, Manchester 1.

Stehli Silks (London) Ltd. Private. Reg. Sept 29. Capital £1,000. Importers, exporters and manufacturers of silk, etc. A. E. Stehli, R. H. Stehli. Registered office: 25 Oxford Street, W.1.

General view of one of the sessions during the Congress

At the Congress. Dr. C. Wurster (chairman of B.A.S.F., Ludwigshafen); Mr. Van Drimmelen (chairman, Duetsche Shell A. G., Hamburg), and Dr A. F. Kertess (Gt. Britain)

Surface Activity Congress

THE Third International Congress of Surface Activity held in Cologne September 12 - 17, was attended by over 1000 delegates from 30 different countries (including 130 from the U.K.). It provided an excellent forum where scientists in the field of surface chemistry could exchange views and ideas, take part in lectures and discussions, and enjoy the well arranged social activities of the conference.

The papers of the congress were divided into four principal sections:—

(*a*) Chemistry of surface active substances.
(*b*) Physics of interfaces.
(*c*) Terminology of surface active substances.
(*d*) Application.

The proceedings of each section, and subsection, were opened by a general survey of the present position, followed by short papers and discussion. Nearly 280 papers were given, 51 of them by British authors.

The papers in section A were mainly concerned with constitution and structure, synthesis and manufacture of surface active substances, also their properties. Section B dealt with physico-chemical problems, interface phenomena, theory of wetting, atomisation, emulsification, and related subjects.

Terminology, analytical testing, radio-active methods for the examination of interface processes formed the subject of Section C; there were also a number of papers on effluent treatment as due to last year's dry summer difficulties have risen in Germany and other countries in sewage processing and in foam formation on rivers. R. C. Tarring (Shell Chemical, London) gave a report on current sewage processing trials in England with a new type of alkyl benzene sulphonate. It was observed that household detergents based on alternative active material was more readily decomposed biologically than that now in general use, and it can be expected the use of the new material would substantially diminish the troubles associated and experienced with synthetic detergents. Other speakers discussed the relation between the structure of detergents and their biological degradation, of methods of elimination of detergent foam by de-foaming the effluents, or by chemical methods.

Of great interest were the lectures given in Section D on the application of surface active agents in the textile paper, leather, laundries and dry-cleaning, cosmetic industries, also in mining and ore flotation, building road making, plastics and surface coatings, and in other industries. The introductory papers and lectures are to be published soon for further studies.

There were a number of social functions, a reception by the Lord Mayor of Cologne, also visits to several works. The congress ended with a very enjoyable banquet in the "Gürzenich." The congress was well organised and the organising and scientific committees were complimented for the detailed and extremely efficient arrangements.

Fastness of Dyed Textiles to Pleating Processes

Abstract of a paper given at the recent Summer School of the Society of Dyers and Colourists

AFTER outlining the steam pleating and setting process, Mr. H. R. Hadfield, M.Sc., Tech. (I.C.I. Ltd.) said it was desirable that the pleating conditions used should be varied in respect of time and temperature only, but in practice there could be a considerable variation in treatment, particularly in respect of the effect on colour fastness, owing to an uncontrolled variation in moisture resulting from the use of equipment which did not allow for standardisation of conditions. However, steam pleating equipment was readily available, and in wide use, which allowed full control of the conditions and thereby gave reproducible results.

Results presented by Mr. Hadfield showed the very large effect moisture could play in determining the degree of staining adjacent white materials. Regarding the design of pleating apparatus, the S.D.C. Heat Treatment Sub-Committee considered that a suitable test should fulfil the following requirements:—

(1) Reproducibility. In the case of pleating and setting the main requirements to obtain reproducible results are control over time, temperature, moisture and an even contact between the test material and adjacent white material.
(2) Good correlation with practical results.

(3) Simple apparatus which is readily available.
(4) Rapid preparation for testing and ease of assessment.
(5) Versatility. A single testing method allowing variations in time and temperature to cover all fibres.
(6) Must be assessed on the Grey Scale.

With the above requirements in hand the S.D.C. Sub-Committee designed a simple and cheap apparatus which could readily be constructed in any laboratory. Interesting features of the apparatus were that (*a*) the spring-loaded outer cover maintained excellent uniform contact between the test pattern and the adjacent white material (this principle might well be adapted with advantage to other fastness tests); (*b*) the virtually constant heat capacity of the apparatus so that there was no variation in the amount of condensed water; (*c*) great care had been taken in describing the use of the apparatus to avoid water splashing, or dropping on the test patterns which would cause faulty results. The I.S.O. had now agreed to the test being a "Tentative test."

Discussing the effect of other variables on pleating fastness, Mr. Hadfield said there was no doubt that a variation in moisture content of the materials was the single biggest cause of non-reproducible results when assessing the fastness to pleating or steam setting. The S.D.C. test had been devised with this in mind. There were, however, other variables which could greatly affect the results obtained in steam pleating and they could be classified: (*a*) variables in fabric construction, (*b*) variables in dyeing method, and (*c*) variables in adjacent fibres.

The Heat Treatment Sub-Committee in their work had not attempted to cover chemical finishing except to indicate that this might very seriously affect the fastness of a dyeing. The reasons for this decision were the impossibility of keeping pace with the numerous processes now being proposed. Chemical finishing, e.g., the Si-Ro-Set finish for wool, did affect the shade of many dyes. The tentative test would be found of value in evaluating the effect of these finishes by an established technique, Mr. Hadfield added.

He then went on to deal with the dry heat pleating and setting process. Dry heat setting of hydrophobic fabrics was carried out either by contact heating with a metal surface, or by means of hot gases. Normally dry heat pressing was carried out by means of contact with a hot surface. The time of heating in both processes was usually short (less than a minute) and the temperature was normally higher than 150°C.

Both the S.D.C. and the A.A.T.C.C. had already published tests for the assessment of colour fastness to dry heat and it would obviously be desirable if one of these tests could be adopted to assess the colour fastness to setting and pleating processes. As a result of experimental work done, however, both tests were rejected as a basis for a suitable test for assessing the colour fastness to setting and pleating processes.

Preliminary alternative tests were then undertaken and although realising the drawbacks the Sub-Committee again considered the use of electrically-heated plates with the temperature being measured by thermocouples. The essential requirements were that both the top and bottom plate should be heated and the temperature should be measured, and that the plates should be large enough to allow side-by-side tests to be carried out. In addition, the temperature of the plates should be controllable.

Before an instrument was constructed the Sub-Committee received information about an instrument designed by the Deutsche Echtheitakommission. This instrument was described as a precision heating press. As it incorporated most of the features thought to be desirable, it was regarded with favour by the Sub-Committee, since acceptance of this design might assist in reaching rapid agreement at I.S.O. Another apparatus, the Thermotest Thodiaceta was supported by the Institut Textile de France.

In a dry-heat test the degree of staining of the adjacent white fabric was clearly important, the speaker observed. Using a wide range of disperse-dyed fabrics, including nylon, triacetate rayon and "Terylene," the staining of adjacent white material composed of nylon, "Terylene," triacetate rayon and viscose rayon was investigated. In every case where staining took place, the heaviest staining was observed on the "Terylene." For this reason, in the S.D.C. test, "Terylene" was specified as one of the adjacent fibres and the other fibre should be the same as the material under test, and it was important to specify the nature of the adjacent white material. During heating certain white textile materials changed shade slightly (e.g. a severe heat treatment would result in a slight yellowing of nylon). When assessing the staining against white fabrics it was important, for some purposes, to use fabric which had been similarly heated in the absence of coloured fibre so as to eliminate the effect of fabric discolouration.

Stenter Housing Transported Complete

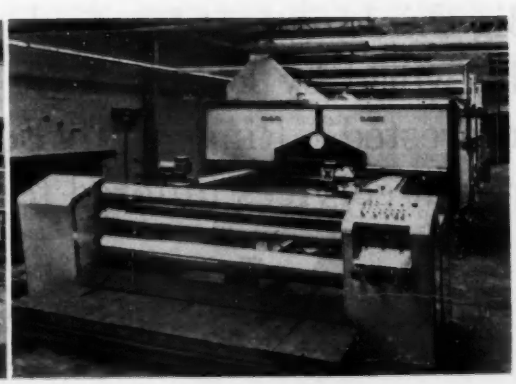
JOHN Dalglish and Sons Ltd., Thornliebank Industrial Estate, Glasgow, recently delivered one of their new textile finishing stenters by a novel and interesting method. The complete machine stripped only of its instruments and entering and delivery ends was shipped to the factory where it will be installed. The picture shows the 30 ft. long housing complete and mounted on the truck which had been engaged to deliver it to its destination. As can be seen the housing had to be supported in a cradle specially designed to prevent damage to the structural members.

This particular stenter is one of the latest textile machines manufactured by John Dalglish and Sons. It has been fitted with two special high temperature sections for heat setting nylon and "Terylene." In addition the machine incorporates the latest design of uncurlers and electronic guiding equipment for guiding the cloth to the stenter pins, and the construction of the housing incorporates air nozzle boxes above and below the fabric. These boxes are supplied from a single fan in each section with a special two speed driving motor; steam heaters are provided for the drying sections and electric elements produce the high temperature required for the nylon and "Terylene" setting sections.

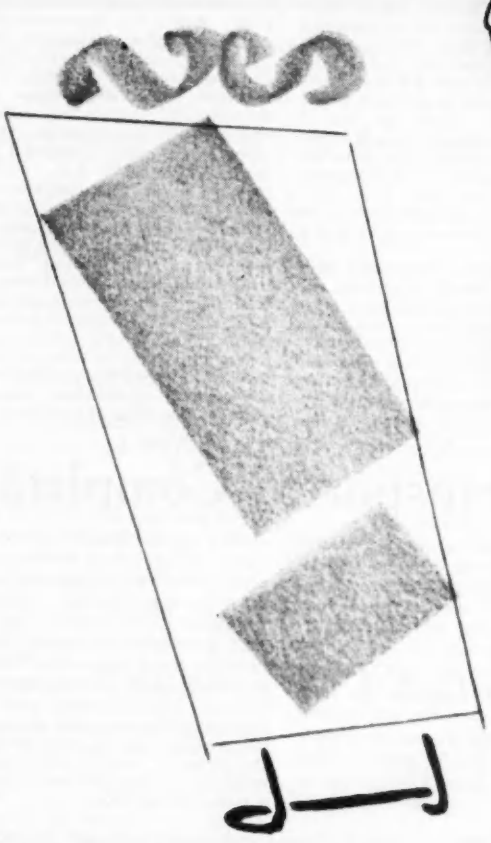
Stenters of the Dalglish Dart design are used throughout the textile industry for finishing under dimensional control fabrics as widely apart as fine lace and heavy carpets. The company point out that delivering a major piece of equipment in one complete unit is, more than a novelty; the saving in time is substantial, and the machine will therefore be in production at a much earlier date.

The 30 ft. housing mounted on the vehicle and ready to set out

Typical stenter erected and ready for service



Suits for Salisbury



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Textile Trade and Prospects

Cotton Production and Trade

World cotton production, estimated at 47·1 million bales in 1960-61, is up 0·7 million from last year and will exceed previous records for the third successive year, says the U.S. Department of Agriculture. Production increases aggregating 1·5 million bales in foreign free world countries—mainly India— are partly offset by a decline of 0·8 million bales in Communist countries. The U.S. crop of 14·6 million bales is about unchanged from 1959. Larger production will result in only a small net increase in foreign free world exportable supplies, as India is rebuilding low stocks and crop increases in Egypt, Mexico and several other countries are largely offset by smaller beginning stocks; also most of the increase could be absorbed by larger imports by Communist countries.

A slightly more settled atmosphere now prevails in Lancashire. Although most order books are well filled the delivery dates in innumerable cases are much too far ahead and it is a dangerously complacent position that could —and is—driving more business into the hands of overseas competitors. Production on the whole shows some improvement with the weekly average production of singles yarn in Lancashire during the four weeks ended October 1st being 14·55 million lbs. compared with 12·70 million lbs. in August. Cloth production was also higher at 36·65 million yds. against 35·44 million yds. in August. The total number of employees on the books was slightly higher at 184,410 in August.

The turnover in yarns has covered practically every count and quality in single, folded and novelty varieties. With coarse yarns the very small margins have restricted inquiry and the bulk of the transactions have been in standard weaving numbers on cop, cone, cheese and ring beams. The better quality yarns have been in good request and fine combed doubling wefts attracted more attention. Blended yarns sell extremely well and the interest in core yarns show signs of steady expansion.

Trading in cloth has been sluggish compared with recent weeks and this may be due to the unsettled conditions in some major consuming industries. Short-time working in the car industry, for example, is certain to have repercussions in Lancashire and these effects can be multiplied by other sections. What effect the credit squeeze has on retail purchases of textile goods is anyone's guess; it may have stimulated a little more interest but the impact has not been noticeable. Much of the volume of business has, of course, been in apparel cloths on home trade account, a large portion being replacement lines. A very wide range of dress cloths for spring and summer have included new design slants in dobby, jacquard, screen and roller printed cloths, Many attractive shade and colour combinations are available. With furnishing cloths, the demand has not been quite so urgent although some good lines have been booked in woven and printed styles in both traditional and contemporary designs. Some manufacturers are relieved at the lessened urgency because it provides an opportunity to organise production on more rational lines. Household textiles continue to sell well in practically all lines. High and medium quality towellings have been well bought and wrapped sets retain their seasonal popularity. Low quality terry cloth finds little support in the market and the interest in cheap roller terry is negligible. Alhambra quilts are now finding much greater favour and "terry-type" bedspreads are in good demand; in fact, the output does not keep pace with present demand. White and colour-woven table cloths, and cotton blankets in subtle pastel shades are selling quite well. Delivery at the moment is of more importance than price, although some buyers still try hard to whittle down present margins. Industrial textiles have been accorded more support and some overseas customers have ordered slightly better in recent weeks.

Wool Consumption, Production and Values

Australia's wool exports in the first quarter of the current season declined by £5,600,000 (sterling) as compared with the first quarter in the 1959-60 season. Value of exports was £40,000,000. Weight of wool exported (212 million lbs.) was down 17 million lbs. Japan, with purchases worth nearly £3,200,000 more at £16,000,000, was Australia's best customer. Britain's purchases fell more than £2,400,000 to £6,800,000. American buying at about £400,000 was almost halved.

Germany retained its lead as the main buyer of South African wool in the first three months of the current season, taking 4·7 million lbs. of greasy and scoured wool. France bought 4·5 million lbs. The U.K.—traditionally main buyer of the Union's clip—followed with 3·7 million lbs. and Italy with 2·3 million lbs. Reviewing the market in September, the South African Wool Commission reports offerings of 149,000 bales—3% more than in September 1959. Earnings at £6.5 million were £1·1 million down on the 1959 figure and the average price dropped by 7d. to 38d. a lb.

Rate of wool consumption in the U.K. in September was lower than in June and 15% lower than a year ago, reports the Wool Industry Bureau of Statistics. September output figures were: Wool consumption, 40·9 million lbs. (clean weight); tops produced, 26·5 million lbs.; tops drawn, 18·8 million lbs; worsted yarns delivered, 21·9 million lbs; woven fabrics delivered, 34·4 million sq. yds; blankets delivered, 3·4 million sq. yds. During the third quarter, U.K. wool consumption was 107·3 million lbs. (clean weight) compared with 119·3 million lbs. in the corresponding period of 1959, a decline of 10·1%. Wool and hair top production of 68·8 million lbs. for the quarter was 14·2% below a year earlier, though worsted yarn deliveries of 55·6 million lbs. were 2·4% higher, and wool cloth deliveries of 88 million sq. yds. were 0·2% higher. Worsteds showed an increase on a year ago of 7·4%, though woollens were 4·8% lower.

Exports of British wool textiles, including tops, for nine months of 1960 totalled £97·2 million, compared with £89·7 million in the corresponding period of last year, an increase in value of more than 8%. In volume, top exports, at 70·8 million lbs. for nine months, were slightly in excess of those for nine months of 1959, a post-war record period. Worsted yarn exports, at 14·6 million lbs. were also at one of the highest levels of recent years, but woollen and worsted cloth exports in total were slightly below last year's figures. U.K. imports of raw wool during the period totalled 502·8 million lbs. (actual weight), compared with 571·1 million lbs. in Jan./Sept. 1959.

Linen Trade Review

The industry is experiencing the normal seasonal slackness following on the autumnal influx of orders for the Christmas trade. Business in hand against ordinary coverage is sufficient to maintain output at current level in both spinning and weaving sections until the New Year. The N. Ireland Ministry of Commerce latest analysis of exports shows that, during the year, these have been well maintained over the whole range of output, though when analysed on the basis of quantity instead of value the upturn is not so great.

While U.K. thread exports have staged a recovery compared with corresponding periods in 1958 and 1959 there has been a substantial decline in demand for yarns, though to date this has been offset by increasing requirements of the home market.

The overall picture of cloth exports is patchy with damask table linens a bright feature, and well supported by other items in the household range. The decline in quantity and in value of those important items included under the heading "sail cloth or canvas" reflects the inroads of competitive textiles in this important market.

With raw material price the most important single item in determining the cost of linen manufacture the fact that the industry in Britian is completely dependent on overseas sources for its requirements makes it very vulnerable to the hazards this implies. Particularly so as its main competitors are located at these sources, and are in consequence saved the heavy freight charges while British importers must pay.

The price gaurantee given by the N. Ireland Ministry of Agriculture to growers this year failed in its aim to revive interest in fibre flax as a crop, and it is obvious that

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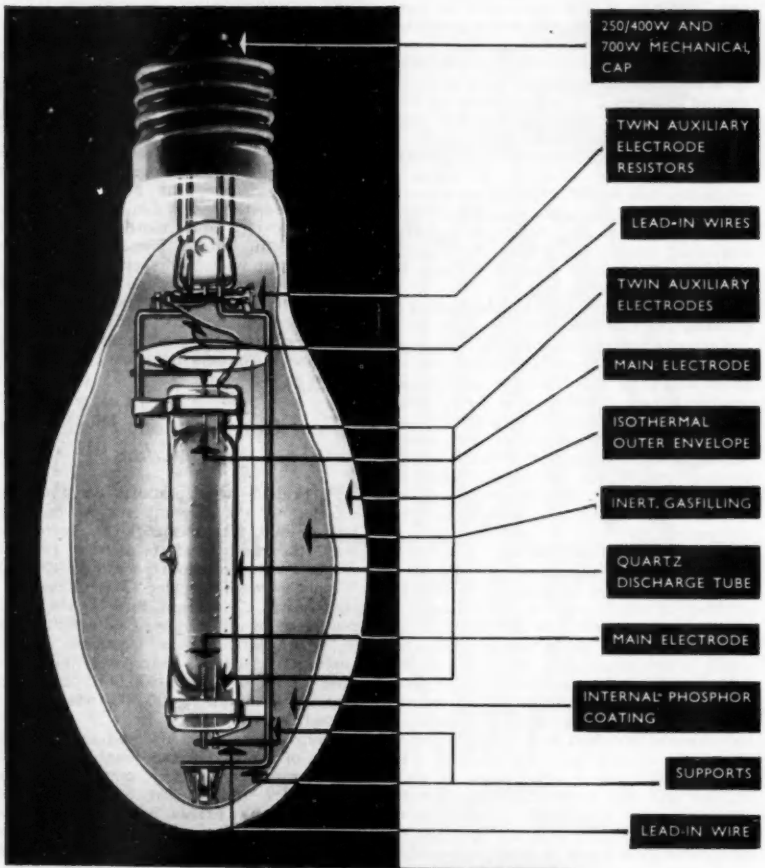

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any hope of success in this direction must involve a radical change in the traditional production and processing methods, which are both objectionable and costly. That this is practicable has been demonstrated by N. Ireland growers and spinners in the past, and is now embodied in manufacturing practice on the Continent. The Irish Flax Crop Committee met again during October to consider a plan of campaign for the 1961 season. An approach is being made to the N. Ireland Government, but it is obvious from past experience that any support from that source can do little to solve the economic problems involved in traditional processing methods, and that the solution lies rather with the spinning section than in Government aid to the grower.

Activities in flax markets reflect the quieter conditions now prevailing. Scutch mills have been stepping up production in recent weeks, and deliveries have increased in bulk and quality range. Demand, though steady, is selective and is insufficient to influence price. Prospects regarding supplies from the U.S.S.R. are still uncertain as to quantity, timing and price. Some lots of Ralo tows are being offered on the basis of £135 per ton for No. 6, and £145 for No. 8.

Agreement has been reached in the wage claim by operatives in the N. Ireland flax spinning trade. The new rates became effective on October 17. The increases are in the order of 8s. weekly for adult male operatives; 6s. for adult females; 5s. for male juveniles; and 4s. for female juveniles. The present working week of 45 hours is to be reduced to 43 in two stages—by a reduction of one hour weekly following the July holiday stoppage in 1961, reduction of the second hour to take effect as from Monday December 4, 1961.

The sixth annual progress survey of the National Industrial Fuel Efficiency Service provides a pointer to ways and means for reducing production costs in linen mills, and backs this up with concrete examples. Over £100,000 per annum was saved by 31 mills following heat and power surveys. Approximately half this resulted from improvements consequent on better instrumentation, higher standards of maintenance, the introduction of mechanical firing, and operative training, the balance resulting from economies and improvements in the utilisation of process heat and steam. This is extensive in the wet spinning and bleaching sections where substantial saving resulted from effective insulation of kiers. With existing drying systems for yarns and fabrics the survey showed that steam consumption ranged from 2 lbs. to as much as 13 lbs. for every pound of moisture removed from the material.

Jute Fibre, Yarn and Cloth

The slightly easier trend in raw jute prices in Pakistan at the end of October was only temporary and values again increased. Lack of loose jute imports from up-country in East Pakistan was the main reason, also a few overseas countries were in the market, including Poland, Burma, S. Africa and Japan. Pakistan mills were buying steadily and paying high prices for raw material; in some cases pucca bales were bought because of the shortage of loose jute. Continental spinners have been remaining out of the market but Dundee spinners have shown a little more interest, mainly for afloat parcels. Sales of raw jute to the U.K. have been large this season as it was anticipated that prices would rise because of the possibility of a shortage. Continental and U.K. spinners have both protested against the high raw jute prices in Pakistan and the shipping of wet jute. The Pakistan government say every effort is being made to combat rising values and they estimate the crop outturn at 5,625,000 bales. To meet the point that arrivals of jute are slow, administrative measures are being taken to encourage farmers to release stocks faster.

Special consideration was given to the question whether present market conditions warranted a quota system to regulate jute supplies to buying countries but it was decided not to interfere with the established channels of trading in jute. As regards the difficulty which shippers have been experiencing in getting jute to fulfil commitments already made, it it has been decided that reasonable extensions will be given, if requested This facility will not, of course, be available in respect of fresh business. The situation continues under close government watch and further corrective measures will be taken from time to time. Action is already in hand both to ensure a bigger crop next year, also earlier sowing.

Despite promises from Pakistan prices continue to rise and there is a feeling this is being stimulated by growers holding back their crop to keep supplies less than demand. A large quantity of the crop has still to come on the market but the flow of fibre is being regulated and is maintaining high prices.

Prices of raw jute in Dundee are irregular due to secured parcels being offered at well under the rate of shippers. Mill Firsts range from £200 to £207, Mill Lightnings from £194 to £200, Mill Hearts from £189 to £194 and grade Hearts from £187 to £190, c.i.f., U.K., for Nov./Dec. shipment. Grade Tossa-2/3 was lowest at £198, grade Tossa-4 at £193 and Continental Tossa-2/3 at £190, Nov./Dec. E.P.C. values were raised at the beginning of the month but it has been decided by the Pakistan authorities that c.i.f. rates will in future be calculated on gross freight rates and not on nett rates. This in fact adds another £1 per ton on the E.P.C., c.i.f. values. Buyers in the U.K. are protesting against this method.

Although Indian jute goods have become dearer during the past month, they are still very cheap as compared with raw jute. A fair amount of business has been taking place in the U.K. but there has been nothing of an outstanding nature. Quotations are now at 88s. for 10 oz. 40 ins., and at 65s. 9d. for 7½ oz. per 100 yds., f.o.b. Calcutts for November and December shipment. B twills were at 271s. 6d. November and at 268s. December. A bye-law brought into force last month by the Indian Jute Mills Association aimed at regulating member mills' purchases of raw jute. A quota will be allocated for each mill to ensure an equitable supply to members' mills.

Another 5% of looms in India were voluntary sealed in October followed by another 5% later. The object is to conserve raw material stocks and prevent demand being greater than the available supply. Demand for yarns and cloth in Dundee has become much less since prices had to be raised because of the much dearer raw material position. However, most producers are still fairly well placed with orders but there has been some reduction in output. With the present high prices in force, buyers will limit their purchases to a minimum and very little interest will be shown in the forward delivery position.

The flax trade in Scotland remains busy and most mills and factories are fully employed to the capacity of the available labour force. Orders are in hand for delivery into next year and this is expected to continue for some time yet. The raw material position is firm with prices ending to rise.

Silk and Man-Made Fibres

A slight slackening in demand has been noticed in the past few weeks but there is still a fair amount of advance ordering in yarns and fabrics and delivery dates—although shorter—are still really too far advanced even yet. In Lancashire practically every type of fibre is in process, including a high proportion of rayon staple. Cotton/"Fibro" blends are in good demand, also blends of cotton/"Terylene," all-Tricel yarns and secondary acetate. Similarly, nylon blends maintain their popularity. A considerable volume of business in dress cloths has been booked for spring delivery and secondary acetate is in particular request for many of these. Most classes of furnishing fabrics are selling well particularly those revealing new approaches in dobby and jacquard designs, also those showing sensible colour combinations and new shades on contemporary and traditional designs in machine and screen-printed products.

Yorkshire sections are quite busy at present but the labour situation continues to give concern in several quarters. Some firms are even conveying operatives from the Sheffield area to parts of the West Riding. Leek and Macclesfield areas continue brisk, with throwsters reporting a steady demand for bulked and modified filament yarns. There is also a good call for all-silk yarns, a demand unlikely to diminish to any great extent in the foreseeable future in view of the steady advance business and inquiry from making-up sections as a result of stimulated wholesale and retail demand.

Smallwares manufacturers are wondering what impact the reduction on the working week will have on costs of products. Most concerns are busy with repeat and new orders coming in already as a result of improved demand. Scarves knitted from woollen and rayon staple are in keen request and jersey fabrics continue to sell well. On the whole knitwear manufacturers are quite active but the Midlands' trade is still harassed by keen competition from imported goods. There is a steady demand for a wide variety of knitted underwear for men and women but so far as outerwear is concerned the market is being seriously affected by imports from abroad, particularly Italian sources. Hosiery manufacturers report a steady volume of business in plain-leg or seamfree nylon hose with fully-fashioned qualities in rather reduced demand. There are hopes that the time, however, is not far off when fully-fashioned will again be in popular demand. Price, however, is one aspect with an important bearing on this question and it is probably the main factor.

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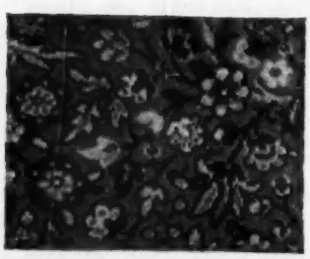

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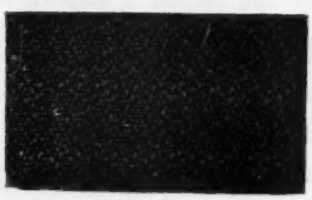

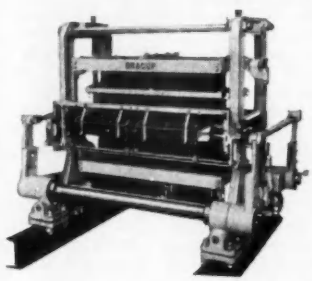

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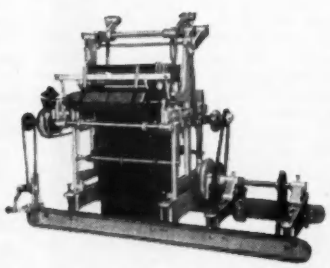

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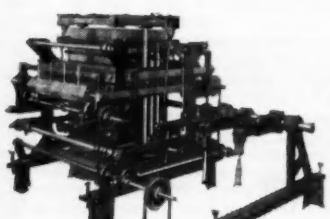

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Notes and News

Wilson, Longbottom and Lansco Ltd.

Wilson and Longbottom Ltd., Barnsley, and the Lansdowne Steel and Iron Co., Morton, U.S.A., have formed a joint subsidiary—Wilson, Longbottom and Lansco Ltd.—the main object being to pool technical research and development for the carpet trade. Lansdowne Steel and Iron Co. have been building Wilton wire looms for over thirty years under the trade mark "Lansco." They are said to be virtually standard equipment in all Wilton factories in North America, and installations have been made in the U.K. and Belgium. Lansco have a staff of engineers and technicians who are devoted to improvement of the present product and development of new products. They are, of course, intimately connected with the special variations of the standard Wilton weave. Over 850 looms of 9 ft. and over have been manufactured since 1945. Wilson and Longbottom's range covers looms for many specialised products including beltings, asbestos, pile fabrics, mattings, jute, also the Shirley loom for synthetic and glass fabrics. On the carpet side, the firm have concentrated largely since 1945 on double shuttle face-to-face looms and approximately 450 have been manufactured in all widths up to 15 ft. The new company can give an enormous breadth of practical experience for the benefit of the Wilton industry.

The first "Lansco" looms to be built under this new arrangement will be 15 ft. reedspace. The loom has been designed specially to cater for high and low qualities both to suit European as well as American fashion, one weaver can operate two broad looms. The looms can be supplied in all widths up to 18 ft. with a number of interesting alternatives including two- and three-shot weaving, wire motions at both sides for one-shot weaving is another alternative and looms may be fitted with a needle insertion system for the weft, thus providing a continuous weft supply without the necessity of changing the shuttles. There are many other interesting technical points on the looms including the special electrical drive with instant stop knock-off, also rack and pinion heald shaft movement, nylon covered steel cable driven wire motion and warp beams with flanges up to 36-in. dia. for the ground warp and 40-in. diameter for the pile beams. The directors of the new company are Mr. Ossian W. L. Porter (chairman) and Mr. I. S. Porter representing Wilson and Longbottom Ltd., and Mr. W. N. Howley and Mr. W. N. Howley, jnr., directors of Lansdowne Steel and Iron Co.

* * *

New Low Voltage Transformer Series

A range of low voltage transformers of advanced design complying with B.S.S. 794 is announced by Gresham Transformer Group, Twickenham Road, Hanworth. These transformers reduce mains voltage for such applications as electric drills, grinders, sanders, inspection lamps, illuminated displays, etc., and many other applications in industry. The totally enclosed transformer in its steel case can be adapted for floor mounting, wall fixing, or for indoor use as a portable unit. It can be supplied "weatherproofed" when the basic unit is modified for conduit or cable gland entry or fitted with Reyrolle plugs and sockets or a combination of all three. These modifications as well as the wall/floor mounting brackets and carrying straps are optional extras. Gresham now manufacture low voltage units up to 1 kVA as described above, and to 5 kVA where it is required to have one major low voltage source which is then distributed in the normal manner.

* * *

Nylon at the 1960 Motor Show

More and more nylon is being used by the British motor industry. One interesting development at this year's motor show, was a new and revolutionary safety device —a seat with its own built-in nylon harness. Made from nylon webbing with a breaking strain of 4,000 lbs., the harness consists of lap straps and shoulder straps. Each of the four straps is spring-loaded so that it retracts into the seat structure. The harness does not interfere in any way with the comfort or normal functions of the seat. Each strap is anchored to an inertia reel, the free ends being held together in a quick-release box. Under normal conditions the harness allows the wearer complete freedom but holds him firmly during heavy breaking or crash conditions when there is violent deceleration. The harness requires no adjustment.

* * *

New Appointments

"Everglaze" Marketing Division announce the appointment of Mr. R. Parkinson as a senior marketing executive. Formerly assistant to the managing director of Raywarp Textiles Ltd., Nottingham, he will be responsible for contact with fabric producers and garment manufacturers in the furtherance of the promotional efforts of the "Everglaze" marketing division, particularly with reference to "Ban-Lon" merchandise of all types as well as "Everglaze" knitted fabrics.

Skefko Ball Bearing Co., Ltd., Luton, announce that Mr. A. I. Helm, the company's plant engineer, has been appointed works manager of the proposed new factory at Irvine, Ayrshire.

Mr. C. E. Passmore, has been appointed field sales manager for the Midland Region of Griffin and George (Sales) Ltd., Ealing Road, Alperton, Middlesex, a member of the Griffin and George group of companies, laboratory equipment manufacturers and suppliers. He will be centred at the Midland Regional Headquarters at Frederick Street, Birmingham.

* * *

New Reactive Dye

Procion Brilliant Blue H5G, an I.C.I. speciality possessing high tinctorial value is applied by the normally recommended recipes for Procion "H" dyes, using either conventional or emulsion thickenings. Besides its value in self-shades, it is suitable for admixture with yellow Procion "H" dyes to give a range of brilliant greens. In the dyeing field, the high tinctorial strength and low affinity will be of greatest value in continuous dyeing processes, and wide use for it is envisaged among dyers using such processes to produce the still popular deep turquoise blues and greens on dress materials of cotton and viscose rayon. The Dyestuffs Division of I.C.I. will supply enquirers with samples and full technical information.

* * *

Indirect Heating System Helps to Reduce Production Costs

In finishing fabrics made from thermoplastic fibres, such as nylon and "Terylene," the material is heat set by subjecting it to temperatures of about 220°C., and this confers dimensional stability unaffected by subsequent operations at lower temperatures, such as ironing, washing or dry cleaning.

At one of their Nottingham mills, Hicking, Pentecost and Co., working in close co-operation with Hygrotherm Engineering Ltd. and Honeywell Controls Ltd., have installed an oil-fired indirect heating system which serves five pin stenters. The system is automatically controlled to within ±1°F, and is based on a specially designed Hygrotherm heat generator, output 5 million BTU/hr. The new installation is said to have shown a substantial reduction in fuel costs.

* * *

Textile Institute

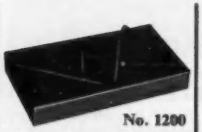
Fellowship of the Institute has been awarded to Mr. W. H. Carter, (senior lecturer, Royal Technical College and Peel Park Technical College, Salford). Mr. E. Moss, (Assistant head, Finishing Dept., British Cotton Industry Research Associa-

(l. to r.) Mr. Ossian W. L. Porter, Mr. W. N. Howley and Mr. Ian S. Porter, directors of Wilson, Longbottom and Lansco Ltd.

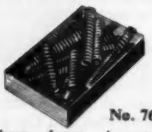
THAT *Experimental Spring* YOU WANT IS WAITING FOR YOU IN THIS BOX . . .

No. 1217. One gross Assorted Springs. A complete Garage Service Kit. 42/- each.

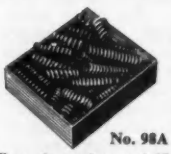
If not, try another box in the Terry Assorted Springs range



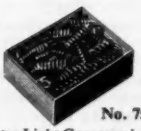
No. 1200
Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. 13/6.



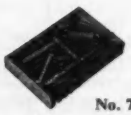
No. 760
Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., ¼" to ⅝" diam. 6/6.



No. 98A
Three dozen Assorted 1" to 4" long, ¼" to ⅝" diam., 19G to 13G. 5/6.



No. 757
Extra Light Compression, 1 gross Assorted, ¼" to ⅛" diam., ¼" to 2½" long, 27 to 19 S.W.G. 15/-.



No. 753
Three dozen Assorted Light Expansion ¼" to ⅛" diam., 2" to 6" long, 22 to 18 S.W.G. 10/6.

No. 758
Fine Expansion Springs. 1 gross Assorted ¼" to ⅛" diam., ¼" to 2" long, 27 to 20 S.W.G. 15/-.

Cut production costs with Terry's Wire Circlips. We can supply immediately from stock—from ⅛" to ¼".

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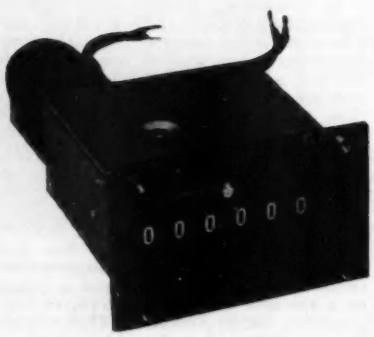

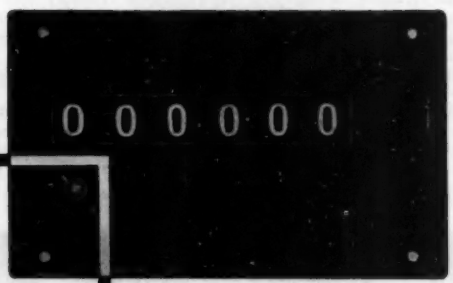

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King Henry's Drive New Addington Surrey
Telephone Lodge Hill 3344-6

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tion). and Mr. P. Thornton, (supervisor of textile training, British Nylon Spinners Ltd., Pontypool).

• • •

Man-Made Fibre Statistics

A sharp recovery from the normla summer lull was recorded in production of man-made fibres in September, according to the British Man-Made Fibres Federation. The September total for yarn and staple was 48·52 mn. lbs. compared with 43·18 mn. lbs. in August, and 43·45 mn. lbs. in September last year. It was again a record for September and the highest monthly figure since May this year. Production of filament yarn at 22·18 mn. lbs. compared with 21·45 mn. lbs. in August and 19·63 mn. lbs. in September last year. Output of staple at 26·34 mn. lbs. compared with 21·73 mn. lbs. in August, and 23·82 mn. lbs. in September last year. Total production in the first nine months of this year was 443·68 mn. lbs., showing a substantial increase over the previous nine months, when the total was 390·42 mn. lbs., and comparing with 368·75 mn. lbs. in the first nine months of 1959. Machinery activity in most sections of the consuming industries remains active and many man-made fibre fabric manufacturers have long orderbooks.

October was also another good month, production of yarn and staple reached 50·21 mn. lb. As with every month so far this year, October output was an individual record for the month. In October, 23·14 mn. lb. of continuous filament yarn was produced, and the corresponding figure for staple fibre was 27·07 mn. lb. The encouraging October figures bring the total for the first ten months of the year up to 493·89 mn. lb. which compared with 427·64 mn. lb. in the previous ten months. Good general activity is recorded in the main consuming centres—Lancashire, Yorkshire and the hosiery industry.

• • •

Modernisation Plans Completed

Fothergill and Harvey Ltd., have now finalised plans for complete modernisation at the company's Littleborough and St. Helens mills. Modern high-speed preparation machinery is to be installed together with fully automatic filament looms and continuous finishing plant. The plans include extensions to existing buildings, more warehouse space at Sladen Woodfor the storage of glass, "Terylene" and nylon products, also a new showroom to take care of expanding trade.

• • •

Home Promotion Plans for Wool

Progress in the British wool textile industry's home market research project was reported by Mr. G. Birkenshaw (vice-chairman, Wool Textile Delegation) at a recent press conference in Bradford. He recalled that, some time ago, the Delegation commissioned a London firm of market research specialists to undertake an investigation designed to determine public spending habits in clothing, and especially garments containing wool. Essential preparatory work was now practically completed and it was hoped that interviewing would commence in the next week or two. "A representative cross-section of the public," said Mr. Birkenshaw, "would be asked about the types of clothing they bought, the frequency of their purchases, their preferances, and other questions carefully framed to elicit information which would be helpful not only in regard to the immediate issue—which was the formulation of a promotion scheme acceptable to the whole industry—but in giving a picture of the apparel market in general and consumers' preferences in particular."

• • •

New Dyestuff

A new dye is announced by the Alliance Dye and Chemical Co. Ltd., Grecian Mill, Lever Street, Bolton, sole agents in this country for Compagnie Francaise des Matieres Colorantes, Paris. Acetoquinone Light Blue BLLZ, for secondary acetate, is claimed to have outstanding fastness to gas-fumes, even in pale shades. The colour has good levelling properties, and for the production of green shades, it may be used with Acetoquinone Light Yellow 3RLLZ or, for brighter shades, with Acetoquinone Yellow 5JZ. Acetoquinone Light Blue Bllz is not dischargeable.

"Terylene" Plant in N. Ireland

Imperial Chemical Industries Ltd. have purchased some 200 acres at Kilroot, nr. Carrickfergus, County Antrim, as a site for a factory for the manufacture of "Terylene" and possibly other man-made fibres. "Terylene" is at present being manufactured at Wilton, and extensions to this plant now under construction are due to come into full operation in 1962. As was announced in 1958, it is I.C.I.'s intention to locate "Terylene" spinning plants in N. Ireland as and when the development of the market for "Terylene" makes these necessary. In August, I.C.I. acquired from Montecatini of Milan exclusive rights for the production and sale in the U.K. of staple fibres, filament yarns and textile monofilaments from polypropylene. Initial manufacture of polypropylene fibre is being undertaken at Wilton, but it is possible this will also be manufactured at Kilroot.

Site development at Kilroot will begin early in 1961 with a view to starting production in 1963. When full production has been achieved, a labour force of about 1,150 will be required and, if the project succeeds in accordance with expectations, it is hoped to expand to give eventual employment to 2,000.

Anglo/U.S. Trade Partnership

Clutsom and Kemp, Leicester, recently concluded arrangements with Darlington Fabrics Corporation, U.S.A., under which both companies will pool their technical knowledge and experience for the production of elastic fabrics. The aim of the partnership is to offer to the world market a comprehensive range of elastic fabrics available from one single source. Clutsom and Kemp will manufacture and supply Darlington corsetry fabrics—batistes, nets, satins and lenos—to the Common Market countries, the European Free Trade Area and the Commonwealth.

Silk Congress 1961

Nearly 350 delegates of 24 nations have been invited to attend the eighth international Silk Congress to be held in London June 12 to 16, 1961. As in 1951 when the third Silk Congress was held in London, the working sessions will take place at Church House, Westminster, and a full programme has been arranged embracing the activities of 17 sections and five special committees. Among questions to be discussed will be measures to intensify silk promotion and the stepping-up of production to meet the greatly increasing demand for silk fabrics. Organisation of the congress is in the hands of Mr. R. R. Catty (director, Silk and Rayon Users' Association), 4 Goodwins Court, St. Martin's Lane, W.C.2.

New Companies

I. Dinnerman (Export) Ltd. Private. Reg. Aug. 18. Capital £1,000 in £1 shares. Exporters and importers of textiles, etc. M. L. Dinnerman and M. Kason. Registered Office: 13 Stratford Place, Oxford Street, W.1.

J. Enright and Co. Ltd. Private. Reg. Aug. 19. Capital £5,000 in £1 shares. Importers and exporters of waste wool, cotton, linen, etc. J. Ehrnreich and Mrs. J. E. Ehrnreich. Registered Office: 10 Coleman Street, E.C.2.

Patent Wringer Co. Ltd. Private. Reg. Sept. 5. Capital £1,000 in £1 shares. Mop and textile manufacturer. B. H. T. Redman and L. Ogden. Solicitors: J. Arnold Brierley and Robinson, Oldham.

Sherick (Textile Waste) Ltd. Private. Reg. Sept. 5. Capital £900 in £1 shares. Importers and exporters of textile waste goods. N. Sherick, J. Sherick and B. Jacobs, 65 Dollis Hill Lane, N.W.2. Secretary: M. Caplin. Reg. Office: 32 Savile Row, W.1.

Harold Conway Ltd. Private. Reg. Aug. 12. Capital £5,000 in £1 shares. Manufacturers of wool, cloth, etc. H. Conway and M. Conway. Registered office: 295 Regent Street, W.1.

Hindle Polymer Wires Ltd. Private. Reg. Aug. 11. Capital £25,000 in £1 shares. Manufacturers of industrial fabrics woven from high polymer materials. T. Hindle, J. R. Hindle, S. Lord, E. Race and K. W. Buchanan. Registered office: 24 Grange Street, Blackburn.

Kenneth Wood (Textiles) Ltd. Private. Reg. Aug. 25. Capital £5,000. Manufacturers, importers and exporters of woollen, worsted and cotton cloths K. Wood, M. Wood, Marion Wood. Registered office: Snow Lea, 103 Lamb Hall Road, Longwood, Huddersfield.

Leonard Golding & Co. Ltd. Private. Reg. Aug. 25. Capital £5,000. Spinners and manufacturers, of cotton, wool, silk and other fibres. L. H. Golding, Mrs. F. Berman, W. E. Ridsdale, Registered office: c/o Moore Stephens & Co., Bucklersbury House, Bucklersbury, E.C.4.

Shonn Bros. Sheffield Ltd. Private. Reg. Aug. 29. Capital £1,000. Manufacturers of textile fabrics. A. S. Shonn, M. Shonn. Registered office: 20 Main Road, Darnall, Sheffield.

S. J. Mayne Ltd. Private. Reg. Aug. 31. Capital £1,000. Spinners, weavers, etc. H. W. Hayhoe, S. J. Mayne. Registered office: 19/20 Holborn Viaduct, E.C.1.

Kingsway Mill Co. (M/C) Ltd. Private. Reg. Sept. 12. Capital £500 in £1 shares. Manufacturers, exporters and dealers in textiles, etc. E. K. Elis, E. Elias. Registered office: 89 Wool Exchange, E.C.2.

Charles R. Milnes (1960) Ltd. Private. Reg. Sept. 13. Capital £2,000 in £1 shares. Manufacturers of all kinds of cotton, woollen and other textile goods, etc. C. R. Milnes and Mrs. I. D. Milnes. Registered office: 20 Major Street, Manchester, 1.

R. B. Wrigley & Co. Ltd. Private. Reg. Sept. 14. Capital £1,000. Manufacturers agent. R. B. Wrigley and D. J. Wrigley. Registered office: 370 Barton Road, Stretford, Lancs.

Italcottons Ltd. (670,122) Private. Reg. Sept. 15. Capital £5,000. Manufacturers of textiles of all kinds. B. Israelachvili, D. Nacmias ,W. Kelly. Registered office: 77 Portland Place, W.1.

N. Packett & Co. Ltd. Private. Reg. Sept. 16. Capital £10,000. Wool tops, noil and waste merchants. G. C. Constantine and Mrs. E. L. Constantine. Registered office: 3 Richard Street, Bradford.

Canterbury Cotton Waste Co. Ltd. Private. Reg. Sept. 19. Capital £40,000. Cleaning waste manufacturers, etc. J. E. V. Ley, S. Wilson, K. M. Herring. Registered office: Canterbury Road, Radford, Nottingham.

Bentonica Ltd. Private. Reg. Sept. 20. Capital £1,000. Importers and exporters of cotton, flax, hemp, and other fibres. H. T. Joshi, E. C. Smith. Registered office: 79 Mosley Street, Manchester 2.

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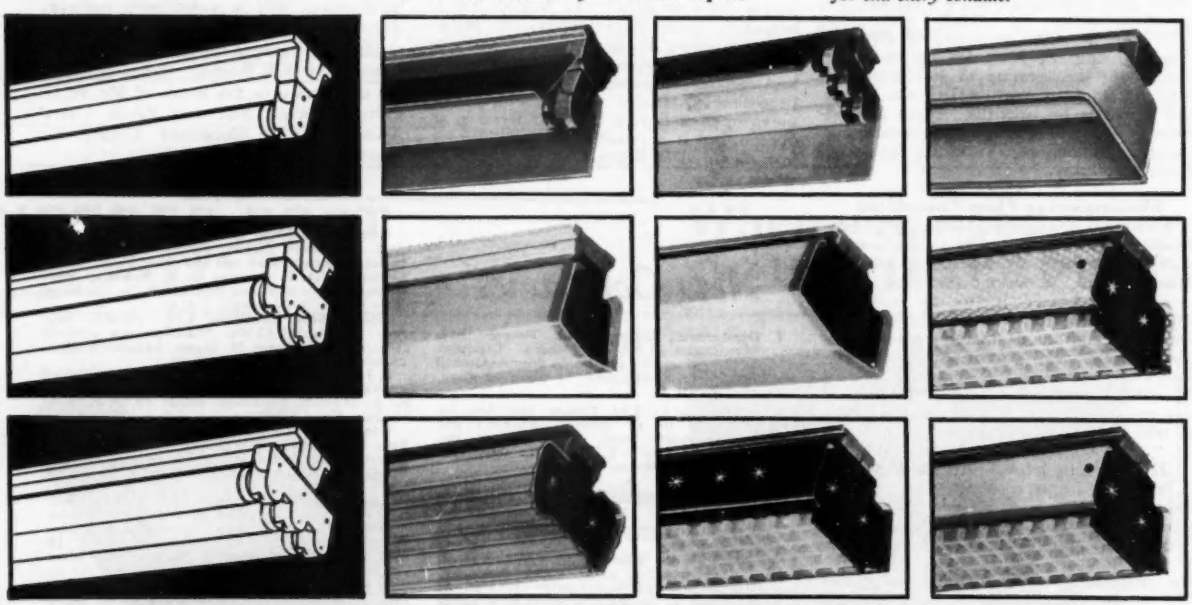
- *Full length back plate with rigidly secured cast alloy ends providing earth continuity for end entry conduit.*



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RECENT TEXTILE PATENTS

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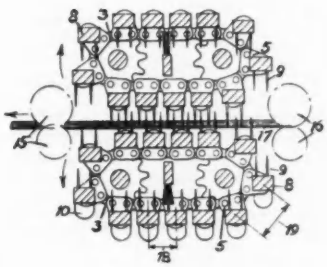
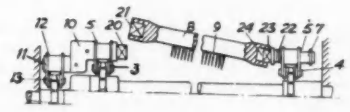
823,708 Improved Gill Boxes

VEB SPINNEREIMASCHINENBAU KARL-MARX-STADT, *Altchemnitzer Strasse 27, Karl-Marx-Stadt, Eastern Zone of Germany.*

Improved gill boxes in which endless chains 3, 4 are equipped with projecting shackles 5. These shackles are fitted with pivot pins 7 which carry the fallers 8 and their gill pins 9. Crank arms 10 are keyed to the pivot pins, each crank having a pin 11 for guiding the fallers, At either end of the gill box is a pair of draft rollers 15, 16. The crank pins 11 are connected with another chain 13 through a set of shackles 12. The chain 13 is displaced in relation to the chains 3, 4 in such a manner that the fallers in moving around the return points of their chains are transferred from





a position above the chains into a position below the chains, or vice versa. As a result, the fallers move the one relatively to the other as they travel around the return points of their chains, since their spacing 18 along the straight sections of their path is increased to the distance shown at 19. Each pin 6 on a shackle 5 of chain 3 is equipped with an angled head 20 for engagement with a socket 21 in the co-operating end of the fallers to prevent the fallers from rotating with respect to them. Also, the pivot pins 7 of shackles 5 associated with chain 4 are displaceable to facilitate the insertion and removal of the fallers. This pivot pin 7 is urged into normal engagement by a compression spring 22. The inner end of pin 7 is provided with a head 23 which engages a cup-shaped socket 24 in the relative ends of the fallers. To remove a faller, all that is required is for the pin to be pushed back against the pressure of the spring 22, when the remote end of the faller can be disengaged from the head 20.

824,619 Drawframe Calendering Mechanisms

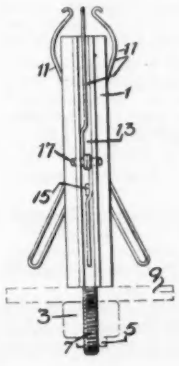
SACO-LOWELL SHOPS, 60 *Batterymarch Street, Boston* 10, *Massachusetts, U.S.A.*

A drawing frame has a pair of output rolls followed by a pair of calender rolls for feeding drafted sliver to a take-up package, the calender rolls having an input trumpet. A sliver-controlling enclosure for sliver extends from adjacent the nip of the output rolls to adjacent the trumpet, and is in the shape of a horn having a narrow rectangular mouth of greater width than height positioned closely adjacent the nip of the output rolls and a throat opening positioned closely adjacent and above the trumpet. The bottom of the horn extends from adjacent the output roll nip to the trumpet and the top of the horn is joined with the bottom to provide enclosed sides along the length of the horn. The top of the horn in the region of the throat is bulged upward for a distance but of decreasing height towards the mouth opening, to provide a flat top adjacent the mouth opening, whereby air expressed from the sliver by the trumpet moves along the bulge towards the mouth opening for absorption into the sliver as it expands after emerging from the nip of the output rolls.

824,700 Yarn Package Supports

BRITISH NYLON SPINNERS LTD., *Pontypool, Monmouthshire,*

Describes a package supports for use on creels and apparatus such as knitting machines. The body of the holder comprises a spindle 1 held in position on a boss 3 by a nut 5 screwed tight on a bolt 7 comprising the end portion of the holder and passing through the boss. A base 9 is secured to the holder and acts as a seating for a yarn package. Three splayed V-shaped springs 11 are secured roughly midway along spindle 1, and each of them is secured in a groove 13. The three grooves are symmetrically spaced at 120° from each other, and each spring is secured at its apex by a pin 17. The lower arm of each spring is shaped by the wire having



been bent backwards and inwards, so that its end 15 impinges on the bottom of its groove, and thus causes the upper arm of the spring to lie close to the side of the spindle, and partly within its groove. When a package is placed in position on the holder, its lower rim will come in contact first with a portion of the lower arms of the springs, and, on pressing the package "home" on to the base 9, the lower arms will be constrained towards the sides of the spindle and partially into their grooves, and the upper arms will be forced away from the sides of the spindle so that their shapes ends grip the inside of the package.

824,719 Card Grinding Apparatus

E. A. SNAPE, 1617 *Hillcrest Road, Laverock, Philadelphia* 18, *Pennsylvania, U.S.A.*

An improved grinding head for a card clothing grinder in which by a novel arrangement of abrasive surfaces, the individual teeth of card clothing may be ground to relatively long-tapered uniform, extremely fine and accurate points. The head comprises a cylindrical head adapted for mounting in the apparatus, the head providing on its outer surface a pair of interlaced grooves extending helically from a central zone of the surface toward each end. The inclination of the grooves is equal and opposite, and an abrasive element in each groove projects radially outward beyond the surface of the head.

824,729 Manufacturing Looped Yarn

ALGEMENE KUNSTZIJDE UNIE N.V., 76 *Velperweg, Arnhem, Holland.*

A method for manufacturing looped yarn, in which a twisted yarn composed of continuous filaments is propelled through a confined zone by a flow of gas having a high velocity, and after leaving the confined zone the direction of movement of the yarn is changed and its speed is decreased, no further twist being applied to the yarn. The yarn is a composite yarn obtained by twisting together two or more twisted or non-twisted threads having different shrinking properties. In one example, an unshrunk polyamide thread of 50 denier, 20 turns per metre, S-twist, and consisting of 10 filaments, was twisted with a fully shrunk polyamide thread of 70 denier, 20 turns per metre z-twist and consisting of 24 filaments, into a composite yarn having an S-twist of 600 turns per metre. The composite yarn was propelled through a tube by a flow of gas in the manner described in B.P. No. 767,835. After leaving the tube the direction of movement of the yarn was changed and then the thread was wound. The winding velocity of the looped yarn was 20% lower than the velocity with which the composite yarn was drawn off a spool. A looped yarn having 600 turns per metre £-twist was manufactured in the same manner. These looped yarns were woven alternately as a weft, the warp consisting of smooth polyamide threads of 50 denier and consisting

of 10 filaments. The fabric was washed over the entire width at 95°C. in a tension-free condition and then dried without tension. Finally, the fabric was stabilized under a slight tension at 190°C. The fabric had a crepe appearance resembling that of a fine woollen crepe fabric. The crepe structure was not lost during dyeing, or after repeated washing.

821,460 Apparatus for Twisting Yarn

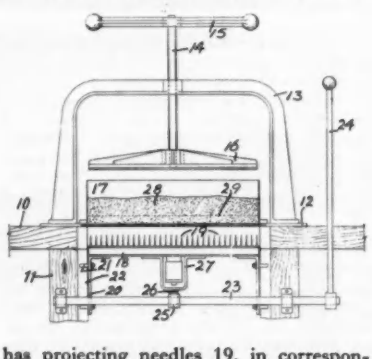
ERNEST SCRAGG & SONS LTD., *Sunderland Street Works, Macclesfield.*

Apparatus for applying false-twist to a yarn, as used in the crimping of filaments of thermoplastic material. The apparatus comprises means for moving a yarn along a predetermined path, and at least two movable surfaces disposed to contact the yarn from opposite sides of that path, the surfaces being displaced relatively to each other so as to make contact at successive positions along the yarn. The frictional contact of the surfaces operates to impact twist to the yarn.

824,941 Manufacture of Non-Woven Fabrics

RICHARD HAWORTH & CO. (MANUFACTURING) LTD., *Ordsall Mill, Ordsall Lane, Salford.*

Describe a method for the manufacture of non-woven fabrics. The apparatus is in the form of a press mounted upon support 10 carried by legs 11. A perforted bed plate 12 extends across an aperture and mounted on this plate is a bridge 13 through which a threaded thrust rod 14 passes. The thrust rod is rotatable by a handle 15 and carries at its lower end a platen 16. Secured to the bed plate is a mould 17, and the perimeter of this corresponds to the shape of the ram 16 which in turn corresponds to the desired shape of pad to be produced with the apparatus. Beneath the bed plate is mounted a platen 18 which contains a suitable electrical heating element and

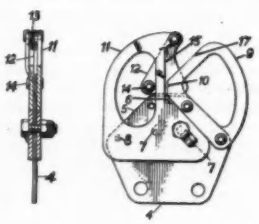


has projecting needles 19, in correspondence with the perforations in the bed plate. To the underside of platen 18 are secured brackets 20 each of which is provided with a pair of studs 21 which project into slots 22 provided in the legs 11 and the support 10. Extending between the legs is a shaft 23 provided with an operating handle 24. An arm 25 projects from shaft 23 under the heated platen, terminating in a thrust roller 26 which engages a plate 27 secured to the underside of platen 18. In making a round pad of polyamide fibres, a mass indicated at 28 is spread as evenly as possible into the mould and the arm 16 is then lowered to compress the mass. The handle 24 is operated to cause the thrust roller to engage the plate 27 and raise the platen 18 so that the needles 19 pass into the mass of fibres. These needles 19, which are heated from platen 18 serve to melt the polyamide fibres at a large number of distributed points. The needles are then withdrawn by lowering platen 18 and the mass is allowed to cool so that the molten parts solidify and act as a cement bonding together the fibres of the mass into a pad of the desired form which can be removed from the mould upon raising the ram 16.

825,098 Slub Catchers

J. S. TAYLOR, *Gelligynan Hall, Llanarmon-yn-ial, Denbigh.*

A slub catcher which can be used with a wide variety of counts of yarn, is self-cleaning and does not allow the yarn to come out if unbroken, and in which the tension is adjustable. The upper part of the plate 4 is in the form of a truncated triangle in which the sides 5 are inclined at 45° to the flat truncated part 6. In the plate there is a slot 7 parallel with each inclined edge and fixed to the plate, through two of the holes 8, are two identical members 9, An edge 10 of each of these members is at right angles to the edge 6. Also mounted on the plate 4 and secured in one of the slots 7 are two other members 11, one being slightly bulged



at the top, one on the back and one on the front, and these two have mounted between them a plate 12 urged downward by a spring 13 and so shaped that it passes at one end between the two members 9. The movement of plate 12 is limited by a stop 14 and this stop, and the shape of the bottom edge of plate 12, are so placed and formed, that the bottom edge of the plate when in working position is parallel to the top edge 6, and the edges 15 of the members 11 are parallel with the edges 10 of members 9 and consequently at right angles to the top edge of plate 4, The two members 9 have inclined edges 17 sloping down to a square hole, and when the slub catcher is in use the yarn is pulled down edges 17 until it encounters the top edge of plate 12 which is pushed back against the pressure of its spring so that the yarn passes it and enters the hole where it is completely enclosed by the automatic return movement of plate 12 and from which it cannot be removed without breaking it or pulling the plate back. The adjacent and engaged edges of members 9 and 11 are both parallel to the inclined edge of plate 4 so that as members 11 are moved up or down the hole retains its square shape.

825,121 Extracting Liquids from Yarn Packages

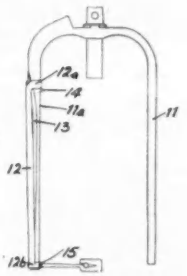
BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester* 20.

Method of extracting a liquid from a wound yarn package comprises submitting the package to axial compression inducing recovery of axial length beyond the natural capacity of the yarn to resile, and causing air or suitable drying fluid to pass through the wall of the package Passage of the drying fluid through the package may also be effected simultaneously with axial compression in the first stage of extraction.

825,372 Improved Flyer

BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury. Manchester* 20.

Describes improved flyers for speed frames which may be rapidly threaded, are easily cleaned and most important, the formation of tufts and plugs is avoided. The flyer 11 is of the usual general shape and has a presser 12. The hollow leg 11*a* has a slot 13 extending from the end adjacent the axis of the flyer to very near the other end. The slot over the curved part of the hollow leg, is on the outside face of this leg. On reaching the straight part of the hollow leg it moves to the trailing face. Just before the end of the hollow leg the slot turns through a right angle terminating on the leading face.

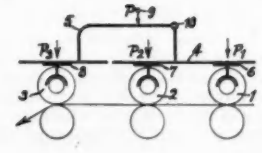


The presser is supported for rotation by means of a part annular portion 12*a* and an annular portion 12*b* at its lower end. The portion 12*a* is supported by the hollow leg 11*a* of the flyer just below the curved portion, a lug 14 being provided to hold the presser in the required position. The portion 12*b* is borne by the lower end part of the hollow leg of the flyer. This part has a slot in which the end of a grub screw 15 runs to limit the rotational movement of the presser. The portion 12*a* is designed so as not to interfere with the introduction of the roving into the flyer slot and the upper edge of the slot 13, where it turns through a right angle is flared to facilitate threading of the flyer.

825,407 Adjustable Drawing Heads

WURTTEMBERGISCHE SPINDELFABRIK G.m.b.H., *Sussen, Wurttemberg, Germany.*

A drawing head is described which not only requires little space but can readily be adapted for dealing with short, medium-length and very long fibres. The drawing head has feed and central rollers 1 and 2 displaceable on a bridge-like holder 4 in bearing carriages 6 and 7. The holder 5 for the delivery roller 3 is connected to the



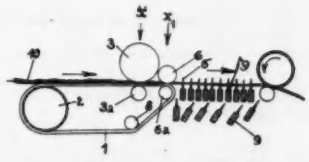
holder 4 and the roller is disposed on a bearing carriage 8 displaceable on the lower horizontal arm of the holder 5. The weighting P acts through the holder 5 and on the holder 4. By adjustment of the rollers in relation to the point 9 of application of the weighting and to the point 10, the component loadings P1, P2, P3 can be suitably distributed between the feed central and delivery rollers. If the three-roller head set for short and medium-length fibres is to be converted to a two-roller head, for dealing with very long fibres, the roller 2 is removed and the holder 4 is then rigidly connected by bolts and a coupling member to the holder 5. The entire weighting then acts on the rollers 1 and 3, so that they provide higher pressures than in the three-roller head.

825,484 Package-Doffing Mechanism
PRINCE-SMITH & STELLS LTD., *Keighley.*

Doffing mechanism for apparatus of the type in which a continuous sliver is wound into a ball or cheese upon a freely rotatable spindle supported in contact with a revolving roller. The apparatus comprises means for measuring the length of material wound on a package, with means for interrupting the feed of material to the winding point when such length attains a predetermined value, and for causing the spindle support to move the spindle and package to a doffing position. A member is provided to doff the package from the spindle, and is automatically operated when the spindle reaches the doffing position. Separate means are automatically operated when the package is doffed, for actuating the spindle support to return the empty spindle to the winding position and for returning the doffing member to the initial position. Means are also automatically actuated when winding conditions are restored for re-starting to commence a new winding cycle.

825,754 Drafting Mechanism and Gilling Heads
J. M. J. SAUVAGE, 95 *rue Grande Foxhalle, Herstallez-Liege, Belgium.*

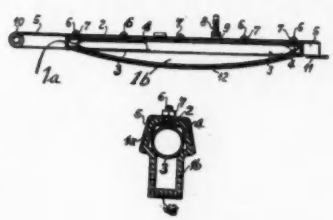
Improved pin drafting mechanism, which ensures the short fibres being effectively controlled and held as near as possible to the field of pins. An endless conveyor-apron 1 supported on a suitable number of idler rollers such as 8, 3*a*, and 6*a* and roller 2 is the tensioning member for the apron. The feed roller 3 receives a high loading pressure in the direction



of the arrow *x* which causes it to drive the apron leading the fibres 10 towards the pointed pins 5 of the gilling-head fallers 9. Two rollers 6 and 6*a* are of small diameter, and roller 6 receives a loading pressure in the direction of the arrow x_1 which is much less than the loading pressure applied to roller 3. The rollers are placed as near as possible to the field of pins with the apron between them. The rollers 3, 6 are acted upon by a sufficient pressure to ensure the fibres being held and fed to the gilling head at a predetermined speed. The loading of roller 6 would be varied according to the average length of the short fibres. The light pressure on roller 6 allows it to control the short fibres and hold them as near as possible to the field of pins. The desired loading pressures upon the rollers 3, 6 may be exerted by weights, springs or by rods on pistons controlled by hydraulic or pneumatic pressure, and the pressure on roller 6 may be varied at will according to the quality and the lengths of the treated fibres.

825,765 Pneumatic Shuttle Box Swells
TISSOMAT A.G., 24 *Burgstrasse, Glarus Switzerland.*

A brake tongue for the compartments of the shuttle box in a loom, includes a channel member, one end of which carries a bearing boss which has a compressible cushion projecting into the shuttle box. When the loom has a shuttle box provided with several compartments, a brake tongue is provided for each compartment of the shuttle box. The air tube 3 is inflated to the desired pressure, When 5 bears against the shuttle box, the front portion 1*b*



of the hollow rubber member projects into the open side of the shuttle box compartment. As a shuttle enters the compartment, it strikes laterally against the front portion 1*b* and is stopped. Braking of the shuttle proceeds gently and almost silently. When the shuttle strikes against the front portion 1*b* of the hollow rubber member, a comparatively large area of contact is formed between the shuttle and the front part 1*b* by virtue of the fact that the front portion 1*b* is compressible, which is of substantial advantage for the braking of the shuttle. The front portion 1*b* of the hollow rubber member is advantageously covered with a wear-resistant coating.

826,914 Tension on Winding Machines
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827,498 Alignment of Rollers in Drafting Mechanism
SKF KUGELLAGERFABRIKEN GESELLSCHAFT. 52 *Schultestrasse, Schweinfurt am Main, Germany.*

Describes a drafting mechanism of great reliability and long life, which is simple to manufacture, and which renders possible automatic alignment of the top and bottom rolls regardless of the position of the bracket on the supporting bar. The bracket is divided into upper and lower portions in such a manner that the lower portion, which is secured to the supporting bar is held against lateral swinging movement. The upper portion, which carries the top-roll arm, is so connected to the lower portion as to be able to swing laterally, in a plane parallel to the plane of the drafting field.

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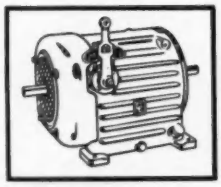

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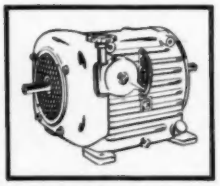

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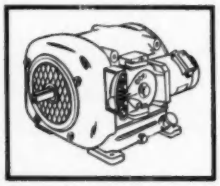

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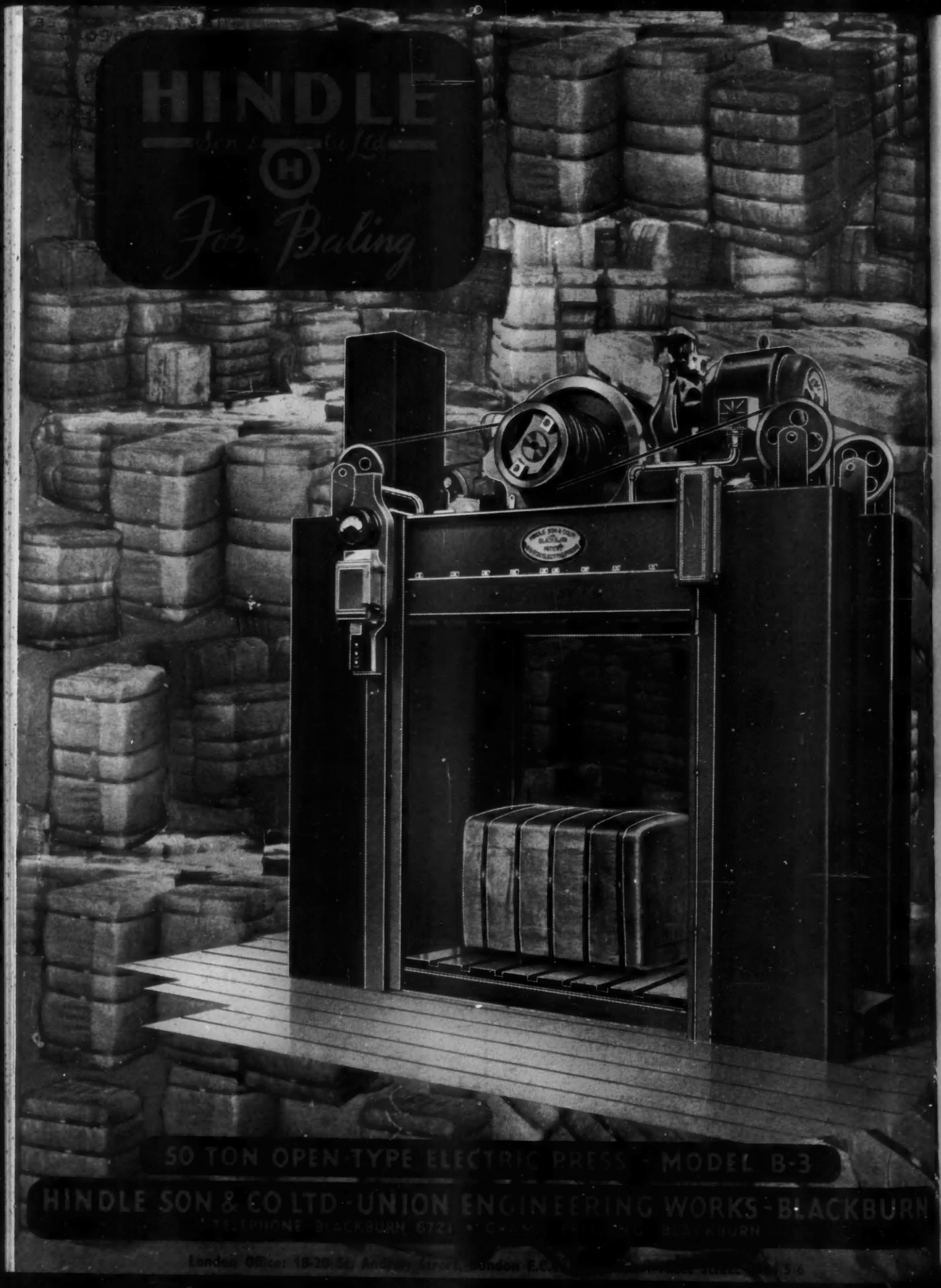
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